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THE WILSON BULLETIN

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THE WILSON BULLETIN

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Vol. 54 JUNE, 1942 No. 2

DEVELOPMENT OF YOUNG GOSHAWKS

BY RICHARD M. BOND

THE nesting habits and development of the young of the Goshawk (*Accipiter atricapillus*) are apparently less well known than is the case with either of the other two North American accipitrines. The following account is based largely on a single bird, but it has been carefully checked by Dr. R. M. Stabler, who has also raised a female goshawk from the nest, and has observed the development of another owned by a friend. The developmental stages of the three followed the same sequence and lasted the same lengths of time within a few days at most. My experiences in raising 33 nestling hawks of other species, and in following the development of siblings of the captives in the wild in nine nests, indicate that the physical and psychological schedule followed by normal and well-fed young hawks of the same species and sex is subject to very slight variation, whether the birds are captive or wild. The only sexual difference consists in a slightly slower development of the females, which may spend a day or two longer in the nest and, in the case of the Duck Hawk, may become independent of their parents as much as a week later than their brothers. Even Bent's (1937: 125–142) generally excellent account contains several questionable statements. These may be taken up in order:

"The young apparently remain in the nest about four weeks . . ." The Dixons' (1938) interesting study shows that the young remain in the nest about 42 days, or 6 weeks.

"The young . . . are fed at very infrequent intervals." The Dixons too believed that the young were fed little and seldom towards the end of their period in the nest (though they observed them to be heavily fed when younger). This idea is not borne out by examination of specimens. Young hawks deprived of food for unusual periods during the growth of rectrices and remiges show very distinct marks of weakness across the feathers, which falconers call "hunger streaks" or "hunger traces."

A young female Goshawk that I took from a nest in Nevada on July 2, 1939 (Bond, 1940) was obtained in the morning before the parents fed her, and I was unable to give her a meal until about 1:00

P.M. A marked hunger streak developed from this delay in feeding. The streak was wider and stronger than any of those on the skins in the Museum of Vertebrate Zoology. Of course, the time of the last meal of the previous day is not known, so the actual time without food is uncertain also. Later, when the bird was well feathered and able to fly (though the flight and tail feathers were still growing) slight hunger streaks developed on days when she was fed only morning and evening, with a maximum waking period without food of only about 9 hours. Since only about 10 per cent of the immature Goshawks in the Museum of Vertebrate Zoology, Berkeley, California, show minor hunger streaks, it would appear that in the wild some 90 per cent of the young are fed at least three times a day, and practically all young at least twice a day, *every day,* not only in the nest but for an appreciable period after they are able to fly.

Bent says of the Goshawk, "When between three and four weeks old, it is fully fledged, except that the last of the down persists on the belly and neck. It leaves the nest at about this stage." If by "fully fledged" is meant that all of the feathers are grown in all the way, the statement is obviously erroneous. The young birds cannot fly till they are about six weeks old, but it is long after this that the feather growth is completed. My young bird could with great effort make a level flight of perhaps 15 feet on July 14, at which time comparison with Dixon's photographs would indicate that she was about 40 days of age, but feather growth was not complete until about August 10, when she was between 65 and 70 days old. Even if (as is possibly the case) she developed a little more slowly than a wild bird would have, she can hardly have been delayed over a week, so that it appears that young female Goshawks are not fully fledged until they are about 9 weeks of age, at least.

Throughout Bent's book, and indeed in most life history accounts of hawks, there are statements about many of the species, that at a given stage or age the young "leave the nest," and the reader gains the impression from these statements that the young leave the nest once and for all at this time, though Bent says of the Northern Red-shouldered Hawk, "They begin by climbing out on the branches and, perhaps, returning to the nest at night," and quotes Bendire on the Mexican Goshawk: "The young . . . were out of the nest the following day but returned to it at night." I believe this is a very common practice among tree-nesting hawks. Herrick (1924 and elsewhere) observed that young Bald Eagles return to the nest, and I have found young of Bald Eagles, Golden Eagles, Cooper Hawks, and Western Red-tails back in the nest a day or more after they have "left" it. Hawbecker (1940) found the same true of White-tailed Kites. Young European accipitrines (*Accipiter gentilis* and *A. nisus*) were known to the falconers as "branchers" when they left the nest by day and hopped and

climbed about the trees while still incapable of extended flight (Bert, 1891).

My young Goshawk gave evidence that returning to the nest was normal behavior. She was provided with a high-sided cardboard box of about the diameter of the nest, in which excelsior and twigs were placed. She soon learned to climb out of the box, though with some difficulty, and spent much of the day wandering around the large room in which she was kept. At first she clambered back into the box every evening and went to sleep there. In scrambling into or out of the box, she did not use her beak, parrot fashion, as I have sometimes seen young Cooper Hawks do. The night of July 13 (39 days old) she slept on a coil of rope beside the box, which was much more like a natural nest than the box and its contents, and continued to use it till the night of July 21 (47 days old), after which she always slept on a perch. This is hardly a proof, but it is certainly an indication that the young may return to the nest at night for at least a week after first flying from it.

Until August 7, when she was about 64 days old, the bird spent considerable, though diminishing, periods during the day resting in a prone position. After that date this behavior was not noted. Whether wild young rest in this position on the ground, in the nest, or on large limbs of trees I do not know, but I see no reason to suppose that this habit in my bird was exceptional (though it may have been protracted) and it may indicate occasional use of the nest by wild young during the day for some time. In the prone sleeping position, the young Goshawk rested on its tarsi, which were splayed out at an angle of some 15 degrees, and on the sternum. The feet were loosely closed, and the wings drooped, so that the outer joint rested on the ground. The head was turned back on either side and partly concealed under the wing on that side. The daytime prone resting position was the same, except that the head was held up.

During the first few nights that my bird slept on a perch she rested on both feet, but later she slept standing on only one foot with the other drawn up under the feathers. The head was turned back and partly concealed under the scapulars. She slept on either foot, but more often the left than the right, and turned her head back on either side. She also held her food with the left foot more often than with the right, and thus appeared to be somewhat "left-handed."

The developmental behavior of young Raptores is exceedingly interesting (see especially Sumner, 1934, and the papers in his bibliography), and many of their activities and reactions change almost from day to day. I have not had the opportunity of observing the first month of development of Goshawks, but young of the related Cooper Hawk begin by being mildly interested in an intruder and may show a desire to be fed if their crops are not full, and sometimes even when they are.

They show little or no evidence of fear until about the time they are able to stand easily (about 15 days in the Cooper Hawk). At this stage a definite fear reaction appears, and for two or three days young birds which I observed have crowded to the far side of the nest from an intruder and cowered there. In a few minutes the reaction "runs down" and the young settle back into the nest. Within a day or two of the fear reaction, and perhaps sometimes concomitant with it (Sumner, 1929), there develops what I have come to call the "stabbing reaction" that causes the young birds to strike or "stab" at an intruding object with the foot. The object is subjected to a momentary hard grasp and the foot is withdrawn. A crouched position, very similar to that of the fear reaction, is often assumed when the "stabbing reaction" is manifested, but whereas in the former case, the bird gives somewhat the effect of shrinking from an expected blow, in the latter one may be reminded of a tom cat getting ready for battle.

The nest from which I took my young bird contained, in addition to the female, a male that was apparently three or four days older than his sister; an addled egg found in the nest probably was laid between the two that hatched, unless Goshawks lay at greater intervals than other hawks of like size. The younger female exhibited the "stabbing reaction," but this, when it failed to discourage me, was quickly succeeded by the simple fear reaction, and she backed to the extreme edge of the nest and very nearly fell out. The older male, although he assumed the "cowering" position and maintained it as long as my companion and I were in sight, showed no fear, and, far from retreating, was most aggressive, "stabbing" at anything that came within reach. The female on the other hand, after a little gentle handling, lost both reactions, unless she was threatened by a sudden motion, whereupon the fear reaction returned. The term "reaction," as here used, refers to what are doubtless chains of several reflexes, some of which may be conditioned. When either of the young birds was seized by the leg or feet, it first attempted to struggle free, and tried to bite only after an appreciable interval.

Defense reactions of young and adult hawks of all species with which I am familiar usually subside quickly if they have no apparent success. If the hand is seized or bitten and (as a natural result) quickly withdrawn, the bird will clutch or bite all the harder and try to do it again. If instead, by wearing a glove or by fortitude, the hand is kept quiet and not even tensed, the hawk usually lets go within a few seconds. In other words, the reaction seems to require more or less continuous stimulus.

Feeding

Immediately after removal from the nest the young bird took food readily from the hand. If given a larger piece of food than usual, she

would attempt to swallow it, but if it would not go all the way down, she would open her beak and shake her head until it dislodged. Occasionally she picked it up and tried it again, but usually she turned her attention to me and waited for another piece. Even if the piece was small enough to be swallowed, but was dropped for some other reason, she usually did not pick it up. It was not until July 10, when she was about 36 days old, that she first put her foot on a piece of meat and tore off mouthfuls with her beak after the normal fashion of an adult, and it took about a week more for her to become adept at it. The common falconine trick of picking up a small object in one foot to lift it to the mouth for swallowing or further tearing (Bond, 1936: 73–74) has never been observed in my Goshawk, nor in the various Cooper and Sharp-skinned Hawks that I have had. Feather development was appreciably more advanced in this Goshawk when she learned to feed by herself than is usually the case with young Cooper Hawks taken from the nest and raised the same way.

Killing Reaction

Accipitrine hawks kill their prey with a clutch of great power that drives the talons deep into the flesh of the prey. The clutch may be maintained for several minutes after the prey ceases to struggle, but if the first clutch is ineffective it may be relaxed, the foot moved slightly and the clutch repeated. Though the initial clutch is usually made with both feet, the feet subsequently are moved alternately, or at least one at a time, so that the prey is never released. After some of the skin or plumage has been removed from the prey with the beak, the killing clutch is relaxed and ordinary feeding begins. My Goshawk first showed the killing reaction in response to moving food on July 27 (about 53 days old). This reaction seldom was evoked by pieces of beef unless they were thrown on the ground or pulled about on a string. It was produced fairly often, however, by dead sparrows or mice even when they were fed on the glove in the usual way. If the bird had been fed on beef for several days and then killed a rabbit, even though she was very hungry she would cuff the rabbit about and "kill" it repeatedly, sometimes for 15 minutes or more before starting to eat (see below under "Play"). Dr. R. M. Stabler (MS) writes that his adult female Goshawk, when merely standing on his fist will exert instantaneous, terrific pressure when he makes a squeak like a dying mouse. My own bird had no such reaction to sounds. The killing reaction seems quite possibly a development of the "stabbing reaction."

Bathing

On July 23, I tethered the Goshawk (about 49 days old) by a small, quiet stream for the first time. She jumped off her perch, and, apparently by chance though perhaps purposely, landed in about three inches

of water where she stood quietly for perhaps 30 seconds. She then let her belly feathers droop loosely into the water, put her head down and tasted it a few times, and then proceeded to bathe substantially like any passerine or other bird. She has spent as much as 20 minutes standing in the water and going through the bathing motions five to eight times in that period. Stabler (MS) says that his Goshawk "has stood in her bath upwards of an hour—even in February. The Peregrines leave it immediately when actual bathing is over—they never 'soak.'" This was near Philadelphia. When the water was deep enough, my bird waded in till the water came about half way up her breast. She frequently ducked her head entirely under the water. The stimulus to bathe is at least partly tactile, since she would go through part of the motions when made to stand in a few inches of water with her hood on (thus being entirely blindfolded), but the completely dis-

Figure 1. Immature female Goshawk in typical pose of playful curiosity. (Photograph by R. M. Stabler, of his bird.)

played bathing reaction seems to be largely a response to visual stimulation, as Sumner (1934) found with the Golden Eagle. Stabler (MS) states that he has "had young Accipiters go through the ducking and body-stooping movements when showered with a watering-pot; or even do it on a bare floor at the mere sight of a sister sloshing about in a bathing pan." The stimulus that causes a hawk to cease bathing, leave the water, and begin to dry and preen herself may be body chill, but this is only a guess.

Play

Some of my Goshawk's activities may be described as play, though the term might not stand analysis in all cases. In addition to cuffing a dead bird or mammal about as described above, she always launched an attack upon her perch each time she was put on it for the day. She would leap into the air a foot or two and seize the perch in her feet, only to leap again, often coming down facing the other way. This seems quite distinct from the wing exercises of young raptores in the nest; it was the attack on the perch with the feet that was important. She also frequently gave the cackle of the adult. This sort of play usually kept up for 10 or 15 minutes. Stabler (MS) reports an extensive repertory of play activities by his Goshawk. She often launches a violent attack on a leaf, stick, or pebble. Both birds seize small objects in their beaks and toss them back over their heads.

When my hawk had been fed and was standing on my glove she frequently fluffed her feathers out a little and let her eyelids droop slightly and would then begin to bite gently at the edge of my coat, the buttons, button holes, a pencil in my breast pocket, my handkerchief or my hair. When she got a good grip on something with her beak, she would often bite quite hard and pull toward her. When she did this, she almost invariably pulled the nictitating membranes at least part way across her eyes. This action of the nictitating membrane is the same as that observed when she wiped her beak after a meal. She frequently succeeded in removing my handkerchief from my pocket, whereupon she might either drop it, or step on it and begin to tear it with her beak. When she was in the mood, a strange object, or even my fingers, at about the level of her feet or over her head would often cause her to turn her head nearly upside down as if to see it the better.

These generalized play activities I have not observed in wild hawks more than a few weeks old, that is, after they have scattered and are on their own. This may be because of difficulties in observation, or it may be exaggerated and prolonged in a bird with its "feeling pent up" by captivity. Stabler (MS) reports no diminution of play by his bird, now nearly five years old.

Dr. Stabler's criticisms and comments on this paper are thankfully acknowledged, as are those of E. L. Sumner, Jr., and Dr. A. H. Miller.

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THE BIRDS OF A BULL'S HORN ACACIA [1]

BY OLIN SEWALL PETTINGILL, JR.

THE bull's horn acacia is a common shrub of the low country of southwestern Tamaulipas, Mexico. In general appearance it is much like other shrubs of the *'huisache'* brushland, but close scrutiny reveals the fact that its thorns are large, paired, and hollow; and that at the tips of the leaflets there are tiny, yellowish, pear-shaped "Beltian bodies" (see Schimper, 1903: 141). These bodies are rich in albumen and, together with a sugary fluid produced by the shrub's petiolar glands, form the food supply of certain red-and-black ants (probably *Pseudomyrma* sp.) which spend their entire lives on the shrub, rearing their young in the hollow thorns. The ants and the shrub live in perfect symbiosis, the former benefiting by the thorns and the food, the latter being defended by the ants. Touch a branch of the acacia and see what happens! Out pours a formidable army, each ant ready to bite and sting in defense of self and home.

Not far from the headquarters house of the 1941 Cornell University-Carleton College Expedition [2] grew one of these dense, broad-topped acacias. It was about twelve feet high. In April it was covered with fresh foliage and golden yellow flowers. Its huge, straw-colored thorns were generously tenanted with *Pseudomyrma*. In the warm sunlight the ants coursed busily over the entire plant—the main trunk, the branches, the leaves, and the flowers. Breaking the paired thorns apart at the point of union revealed the presence of eggs, larvae and excited, bellicose adults.

This particular acacia might never have been noticed had not a pair of Derby Flycatchers (*Pitangus sulphuratus texanus*) chosen to nest in its top. Here, early on the morning of April 1, both birds were discovered carrying big mouthfuls of grass and weed-stalks. The nest had obviously just been started. The birds stopped building shortly after they were discovered and departed without a syllable of protest.

During the following three days the flycatchers were seen several times within a short distance of the acacia, but no building was observed and the nest's foundation remained crude and scanty. On April 5 building was resumed for two hours, both male and female participating energetically. Together the pair flew in from a distance, alighting on a tall tree near the acacia. After some minutes of hesitation at this lookout post, one bird swooped gracefully down to the acacia and set to work. Somewhat clumsily the mouthful of grass was added, pressed down with feet and belly, and molded to the contours of the body. The bird turned

[1] I appreciate the careful criticism of this paper by George Miksch Sutton and Margaret M. Nice.

[2] On the Rancho Rinconada, near Gomez Farias, Tamaulipas.

almost incessantly, now and then lifting the edges of the foundation with its bill, thus beginning the walls. Cries continued to come from both birds; low, conversational syllables from the builder; loud, piercing notes of *geep, geep career!* from the mate on lookout. When one bird was through at the nest, the other descended with its mouthful. Sometimes their mouthfuls were so bulky that they flew awkwardly. Occasionally only one bird brought nest material; again, both brought material, one depositing it while the other waited its turn, with mouth full, only a few inches away. They were never out of sight of each other while building; nor were they silent for more than a few seconds at a time.

Figure 1. Derby Flycatcher carrying nesting material. The bird is sitting on a branch of the bull's horn acacia.

During this two-hour period of activity motion pictures were obtained without the aid of a blind at a distance of *fifteen feet*. Little did I realize that this one spurt of nest building was the most intensive I would witness.

The flycatchers visited their nest infrequently during the next two days, their coming invariably being announced by loud cries. Even by April 7 the nest had changed but little. From April 8 to 14 the birds

came to the acacia now and then, but they showed little interest in it. A few loud calls, prolonged vigil at the lookout tree, swoops to the nest with wisps of material, long absences: these were the usual thing. The nest gradually increased in size, of course. The walls rose. A thin dome with ample entrance at one side became vaguely visible. By April 14 the nest was large and conspicuous, almost as visible as the acacia itself!

On the morning of April 14 we erected a tower blind about fifty feet from the acacia. The blind itself was eight feet from the ground and was covered with firm, light weight, green tent-cloth. On each of its four sides a spindle-shaped aperture was cut.

On April 16, I was surprised to discover long strands of palmetto fiber *within this blind*. Some were dangling slack, half pulled through the apertures; others were scattered on the floor; still others, in an upper corner and oddly entangled, were suspended from two fibers looped through the fabric as if by an upholsterer with sickle needle! My astonishment was by no means lessened when, fifteen minutes later, a female Hooded Oriole (*Icterus cucullatus cucullatus*) suddenly appeared at an opening, perceived the photographer, and hastily departed, dropping the fiber in her retreat. From a tree close by she scolded harshly. Soon her mate appeared and both birds scolded. The cloth roof of the blind, it appeared, had been chosen in preference to that time-honored nesting site—the under side of a palmetto leaf. Never had a higher compliment been paid to a blind-maker! But, although delighted with this wholly unexpected turn of events, I was obliged to face the fact that this sanctum was no longer a hide. What the blind might do to conceal me, the orioles now would promptly undo!

For seven days the flycatchers continued with their dilatory building, but the oriole went on diligently selecting her fibers with care and carrying all material by herself. Her mate sang persistently and often escorted her to and fro but did not once enter nor alight on the blind.

The oriole nest was attached to the cloth in four places where from six to eight fibers were looped through holes punched by the bird's bill. The loose ends of these fibers were drawn together and interwoven, thus forming a strong hammock in which the cup was placed. In reaching the cup the bird was obliged to squeeze through the narrow space between the nest's rim and the roof of the blind.

On April 23 the flycatchers' nest appeared to be finished. The roof was now thick and compact, the opening distinct, the interior dark. But what was in it? No one cared to climb the ant-guarded acacia. The blind would have to be moved, that was obvious. Oriole or no oriole, close-up photographs of the flycatchers would have to be taken, and a platform was needed for determining the contents of the nest. The blind was moved at noon. Both Hooded Orioles were away. The flycatcher's nest was empty. As the blind was set in its new position close against the acacia the big, vociferous Derbies were nowhere to be seen.

When, in mid-afternoon, I approached the blind (now about fifty feet from its original position) the female oriole flew out with her usual flurry and protested vigorously. Within half an hour the Derbies returned to their lookout. One promptly flew down to the nest with some grasses in its beak, entered, deliberately added these bits to the lining, and remained. The other departed. After a stay of perhaps a quarter of an hour the bird at the nest slipped away quietly.

While the Derbies were off a pair of Social Flycatchers (*Myiozetetes similis texensis*), which for several days had been noted about the

Figure 2. Social Flycatcher on the bull's horn acacia.

Rancho, suddenly alighted on the acacia. In their beaks were tufts of soft, yellowish, plant down which they hurriedly stuck into a thorny crotch about five feet from the Derby Flycatcher nest. Apparently this was not their first visit, for foundation material of a similar sort was already in place. The Derbies did not return. The Social Flycatchers went on with their work. The Hooded Orioles flitted about, scolding harshly, but at this the Social Flycatchers showed neither offense nor alarm. That evening the blind was moved to the other side of the tree whence the newcomers could be watched to better advantage. In the big Derby nest there was now one egg, It had been laid since mid-afternoon.

The next morning, April 24, the Hooded Oriole was in the blind (now in its *third* position). The Social Flycatchers were extremely active. They chattered constantly, were erratic in manner, as usual, fluttering their wings as if nervous or frightened, in all ways furnishing a marked contrast to the stolid Derbies. Their fidgetiness—their almost comical refusal to keep still—called to mind some form of *hyperthyroidism!*

Four times during the three hours of observation that morning the Derby Flycatchers returned to their nest, one bird bearing each time a few wisps of grass and remaining in the nest from fifteen to twenty minutes, the other staying at the lookout. Only once did they display resentment toward the *Myiozetetes*. The bird on the lookout suddenly swooped, chased one of the smaller flycatchers with loudly snapping mandibles, and disappeared. The *Myiozetetes* resumed work as soon as the Derby was out of sight.

The Social Flycatchers' nest-building habits were much like those of the Derbies. The male and female invariably went about together, each one carrying material and placing it in the nest. The nest was much like the Derbies' too, with the entrance at the side. It was considerably smaller, however, and the materials used were noticeably softer.

On the morning of April 28 both the Derby and the Social Flycatchers were at the acacia, but all four birds were comparatively inactive. That afternoon neither species of flycatcher was in evidence, but the oriole was hard at work, her nest now almost finished. During one quarter-hour period she was seen to enter the blind with fibers several times.

Wishing to photograph the oriole as she entered the blind, I set my camera up twenty feet away and carefully pinned shut all the openings save that facing me. Soon the oriole appeared, flew to the top of the blind, uttered a few alarm notes, and disappeared on the other side. A few moments passed and all at once out flew the oriole through the unpinned opening at the front! Determined creature that she was, she had forced her way through one of the *pinned* openings. The openings were now pinned shut anew, with their edges overlapped. Photographic success came at last when the oriole, failing to force an entrance elsewhere, finally gathered courage and entered at the desired place. This time the movie camera was exposing film!

On April 29, the last date on which observations at the acacia were made, the Derby Flycatcher nest held five eggs and the Social Flycatcher nest appeared to be about half finished.

Discussion

1. At no time during the observations were ants seen to annoy any bird that perched on the acacia, or to enter either flycatcher nest. Carriker (1910: 715) reports finding a *Myiozetetes texensis columbianus* nest in a "Cornusuela" tree—presumably an acacia—that must

have been, like the acacia at the Rancho, a myrmecophytic species, for it was tenanted by a "medium-sized black ant." The flycatcher nest held two slightly incubated eggs, so ants and birds must have lived without troubling one another. The slightest disturbance to any part of the tree, however, caused the ants to pour out ready for warfare!

In Salvador, Van Rossem (1914: 11–12) found Derby Flycatchers choosing for some of their nesting sites small mesquite-like trees with "greatly enlarged and swollen thorns" which almost without exception harbored ants. The ants "seemed to cause the birds no inconvenience."

In British Guiana, Cleare (1923: 182) reported Derby Flycatchers building their "nests close to large nests of wasps." Presumably the wasps caused the flycatchers no annoyance.

At the Rancho Rinconada the ants were ready to move onto any human being that disturbed *living parts* of the acacia. Whether they would have attacked when dead twigs of the acacia were touched is questionable. Perhaps the deadness of the flycatchers' nest-material furnished the nests with some protection.

2. I was much impressed with the fact that the Derby Flycatchers took *24 days* to finish their nest. Reviewing my notes covering this period (April 1 to 24) I was convinced that the most intense activity was shown on the fifth day. As for the *Myiozetetes*, they were very active during what was thought to be the first two days of nest-building, but it will be remembered that when the pair were first observed at the acacia the nest was already started. The Hooded Oriole showed more or less intense activity throughout the observed nest-building period of 11 days.

A pair of Derby Flycatchers watched by Van Rossem (1914: 11) in Salvador required "nearly a month" for completing their nest.

Observations as to the time taken by the Derbies in completing their nests tend to substantiate the generalization that tropical birds, particularly passerine birds, are much more deliberate in their nidification than allied forms of more northerly latitudes. Sutton (1928: 151) has reported on the nest of a Kingbird (*Tyrannus tyrannus*) built in Pennsylvania in thirteen days. Gillespie (1927: 53) has presented four Pennsylvania nesting records of the Crested Flycatcher (*Myiarchus crinitus*) which show that the period between the beginning of nest building and the laying of the eggs varies from seven to nine days. DeGroot (1934: 9) has observed that a Western Wood Pewee (*Myiochanes richardsoni*) in California completed a second nest of the year in three days. Information on the second nesting of an Alder Flycatcher (*Empidonax trailli trailli*) in Quebec has been obtained by Mousley (1931: 551), "the time occupied in building a new nest and laying a second set of eggs being ten days approximately." Chapman (1928: 165) found that Wagler's Oropendolas (*Zarhynchus wagleri*) of Barro Colorado Island, in the Canal Zone, required "about one

month" to complete the nest, while Herrick (1911: 364) determined that the main period of construction in the case of a Baltimore Oriole (*Icterus galbula*) observed in Ohio necessitated "about 4½ days." Perhaps the most convincing proof that nidification requires less time in northern than in southern latitudes has recently been presented by Blanchard (1941). After studying the annual cycle of two races of White-crowned Sparrow—*Zonotrichia leucophrys pugetensis*, at Friday Harbor, Washington, and *Z. l. nuttalli* at Berkeley, California—she concluded (p. 49) that birds nesting in the "short-seasoned latitudes of the Canadian border compress the active part of their reproductive cycle into less than two-thirds the time consumed by the populations of central California. In 1936 the birds at Friday Harbor segregated into pairs, established territories, and fledged three broods in less than four months. In the four years from 1935 to 1938 inclusive, the Berkeley birds consumed from 6 to 6½ months (an average of 6.3 months) to achieve the same fraction of the cycle."

3. Both sexes of the Derby and Social Flycatchers participated in nidification. So far as I know, females of Tyrannidae breeding in temperate North America build their nests unaided by the males.

4. The Social Flycatchers apparently selected the acacia because the Derby Flycatchers were nesting there. As Sutton and I have indicated elsewhere (1942: 22), each of twelve *Myiozetetes* nests (including the one now being discussed) under observation during our 1941 expedition was built near the nest of some other bird, either a Derby Flycatcher, Rose-throated Cotinga (*Platypsaris aglaiae*), Alta Mira Oriole (*Icterus gularis*), or Boat-billed Flycatcher (*Megarynchus pitangua*). In each case observed, the *Myiozetetes* nest was started after the nest of the companion species was wholly or partly finished.

Summary

The myrmecophytic bull's horn acacia, offering as an inducement its big thorns, sweetish fluid, and food bodies, attracted an ant population that in turn defended the shrub. This symbiosis between plant and insect did not prevent certain birds from nesting in the shrub. In the case discussed, two flycatcher species nested simultaneously in a twelve-foot acacia. These flycatchers were not observed to eat ants and the ants did not molest the birds nor their nests.

The smaller flycatcher (*Myiozetetes similis*) apparently chose to nest in the same shrub with the larger (*Pitangus sulphuratus*) because of the latter's ability to drive off larger enemies.

The interesting association of plant, ants, and birds attracted a wild-life photographer who, in order to secure good pictures, was obliged to erect a blind close by. The blind was chosen by a Hooded Oriole as the site of her nest.

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BREEDING BEHAVIOR OF BELL'S VIREO IN ILLINOIS

BY F. A. PITELKA AND E. J. KOESTNER

DURING the late spring and summer of 1939 we made observations on the nesting of Bell's Vireo (*Vireo belli*) at Urbana, Champaign County, Illinois. This study, while extending from May 24 to July 29, was based on necessarily brief, but regular, observations totalling approximately 35 hours. Five nests belonging to two pairs were located on the south campus of the University of Illinois. Most of the observations were made on four nests of one pair which confined its activities to a grassy area of approximately three acres containing scattered patches of shrubby fruit trees and several masses of shrubs (*Rosa* and *Ribes*). This location is referred to as area "A" (Figures 1 and 2). Supplementary observations were made on the nest of a second pair whose home area ("B") was separated from area A by a distance of

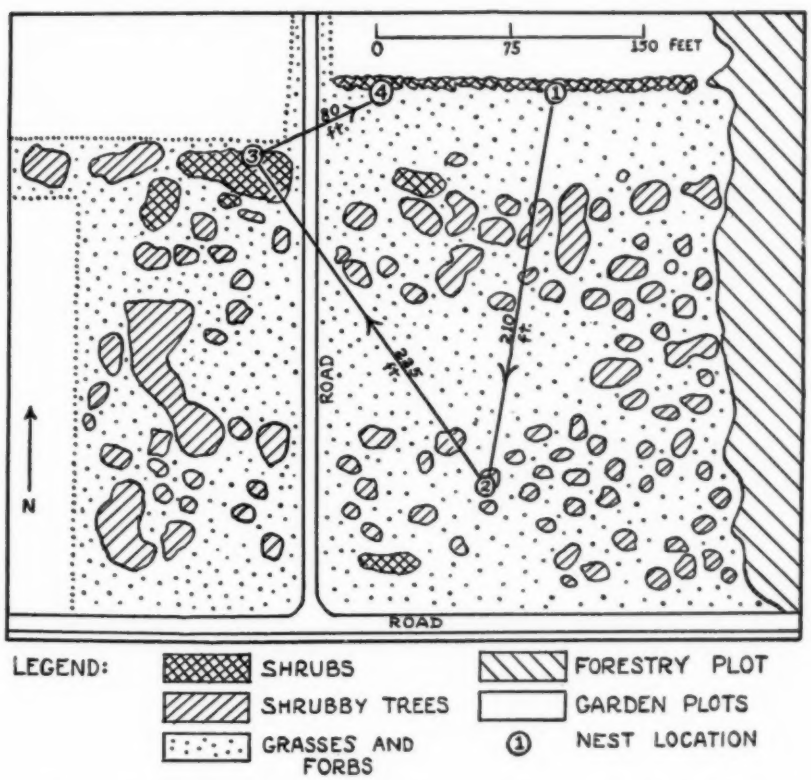


Figure 1. Map of area A, showing vegetational characters of the habitat and location of the four nests. Distances between successive nests are indicated.

Figure 2. Scene in area A, facing northeast. The apple tree at left center contained nest 2. The higher trees of the forestry plot are seen in the background.

approximately 500 feet over open, tilled garden plots to the north of area A. The edge of a dense forestry plot connected the two areas (Figure 1), but no Bell's Vireos were noted along here during the period of breeding activities.

Summary of Nesting Events

The day-to-day developments in the nesting efforts of pair A are summarized below. Apparently the same two birds of area A remained there throughout the breeding period. Members of a pair were distinguished only by a certain behavior traits (song of male, scolding and wariness of female, etc.; see Nice, 1929).

NEST 1

May 26—11 A.M. Nest contained one egg. Female on nest.
7 P.M. Female on nest.
27—Eggs 1 and 2, plus a Cowbird (*Molothrus ater*) egg. Male noted incubating.
28—Nest contained only a Cowbird egg. Nest deserted.
29—No further developments.
30—Nest and egg collected.

NEST 2

June 2—Nest contained one egg.
3—Eggs 1 and 2, plus a Cowbird egg.
4—Egg 2 gone; egg 1 and 3, plus *two* Cowbird eggs. Nest deserted.
5—No further developments; nest with two vireo eggs and two Cowbird eggs collected (Figures 2 and 3).

NEST 3

June 7—Nest incomplete; interior included some large leaves and lacked a smooth lining.
8—Nest lined with grasses.
9—No activity about nest.
10—Egg 1, plus a Cowbird egg. Female on nest.
11—Eggs 1 and 2, plus a Cowbird egg.
12—Eggs 1, 2, and 3, plus a Cowbird egg.
13—9 A.M. Eggs 1, 2, 3, and 4, plus a Cowbird egg.
6 P.M. Only eggs 1, 3, and 4, plus a Cowbird egg; nest deserted.
14—8:55 A.M. Egg 3 missing.
15—6 P.M. Egg 4 missing (no earlier visits).
16—No further developments; nest with one vireo egg and one Cowbird egg collected.

NEST 4

June 14—Adult carrying nesting material at new location.
15—Male singing vigorously at new location.
16—Nest incomplete.
17—Nest contains one Cowbird egg; lining appears thin and incomplete.
18—One vireo's egg; Cowbird egg slightly imbedded in lining indicating addition of material subsequent to its appearance.
19—Eggs 1 and 2, plus a Cowbird egg.
20—Eggs 1, 2, and 3, plus a Cowbird egg.
July 3—Eggs 1 and 2 hatched.
14—Two young leave nest; nest and remaining eggs collected (Figure 4).

Lengths of Phases of the Nesting Cycle

The nest-building period was determined to be four days in the case of the fourth nest. On the basis of intervening periods between nests No's 1 and 2 and later No's 2 and 3, the building periods for nests No's 2 and 3 were four and five days, respectively. Nice (1929: 16) reports a period of six days.

Our observations show that incubation began on the day that the first egg was laid (Lewis, 1921: 32; Simmons, 1925: 250). The female was noted at that time on nests No's 1, 3, and 4. In fact, the premature appearance of a Cowbird's egg in nest No. 4 apparently stimulated the female to incubate before the nest was completely lined and one day before her first egg appeared. Lining material was added to that nest so that the Cowbird's egg was partially buried; but on the other hand, its presence apparently hindered the female from adding as complete a lining as she had in earlier nests. The male was noted incubating at nest No. 1 after the appearance of the second egg.

In nest No. 4, eggs 1 and 2 hatched 14 days after laying of the second egg. A similar incubation period was recorded by Nice (1929: 13). The intervals between the laying of the last egg of one nest and the first egg of the next nest (area A) are extracted from the above summary as six, six, and five days, respectively. Between May 26 and June 20 (26 days), the female of pair A laid a total of twelve eggs. (All observa-

tional evidence suggests that the same birds remained on area A throughout the breeding period, but this was not proven conclusively. No additional vireos were seen there at any time).

In nest No. 4, nestling life lasted eleven days.

Cowbird Parasitism

Bell's Vireo is commonly parasitized by the Cowbird (Friedmann, 1929: 237). Three of our five nests were deserted probably because of Cowbird activities; from the other two, young were fledged. Nice (1929)

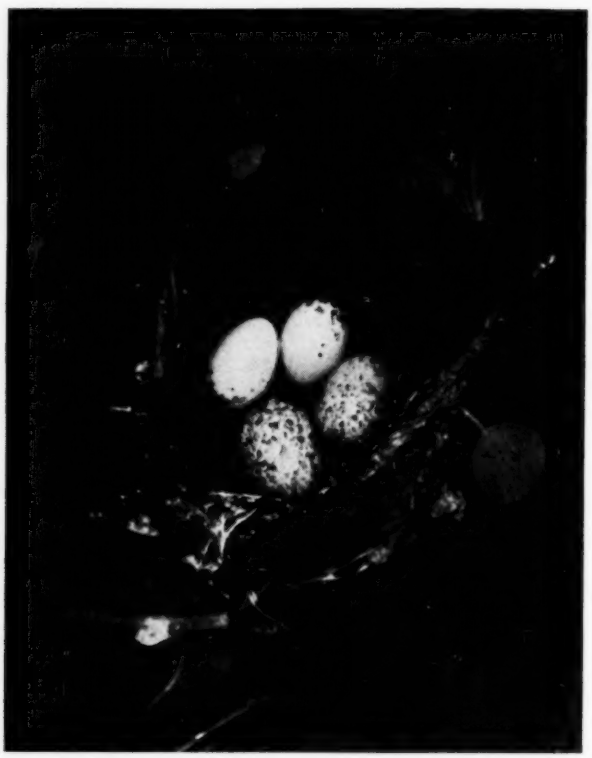


Figure 3. Nest No. 2 with two Vireo eggs and two Cowbird eggs. Inside diameter of nest, 4.5 cm.; outside diameter, 7 cm. The nest was two feet above the ground in an apple tree.

records nine nests of Bell's Vireo all of which were known to be unsuccessful, seven due to Cowbird parasitism. Bennett (1917) records twelve nests, three of which were unparasitized and successful; seven of the remaining nine nests were parasitized. Thus, out of a total of

26 nests mentioned here, only five were successful; of the 21 unsuccessful nests, 17 were failures apparently because of Cowbirds.

In our observations five Cowbird eggs were laid in the four nests of pair A. None of these hatched. The nest of pair B, observed with three young on July 11, apparently was not parasitized.

Bell's Vireo may desert when the Cowbird adds its eggs to the nest (Lantz, 1883). Other individuals of this species, as in our observations,

Figure 4. Adult Bell's Vireo at nest No. 4. The nest was 30 inches above the ground.

may tolerate the added eggs and may accept them even if they appear before the host's first egg, as in nest No. 4, but desert when an egg is removed. Still others may continue to attend a nest containing only

eggs of the Cowbird (Bennett, 1917: 286, 292). This type of variation has been noted within other species, also (Friedmann, 1929: 193; Pitelka, 1940: 6).

While we did not succeed in observing a Cowbird at or about any of the nests, the general circumstances of egg removal lead us to suggest that at least at nests No's 1 and 2, one female was responsible. At nest No. 1, both eggs of the host were taken; at nest No. 2, one egg was taken. Removal of eggs commenced after the appearance of the first and (in nest No. 1) only Cowbird egg, and probably occurred during the day that the Cowbird added its egg. In any case no eggs were removed before or at the time of laying.

At nest No. 3, three eggs were removed on successive days. Removal commenced three days after the appearance of the Cowbird egg. The first egg was taken between 9 A.M. and 6 P.M.; the second egg was taken on the following day before 8:55 A.M. In his study of molothrine parasitism of the Ovenbird (*Seiurus aurocapillus*), Hann (1941: 220) found removal to occur usually in the forenoon of the day of laying or on the preceding day. He regards a one-day lapse between appearance of the Cowbird egg and removal of a host's egg as rare. A three-day lapse occurred in removal of eggs from nest No. 3. It is still possible, but unlikely, that a Cowbird was responsible.

At nest No. 4, a Cowbird egg was added one day ahead of the first vireo egg. If the female Cowbird appeared to remove a host's egg following the laying (before 9 A.M.) of its own, the effect of the absence of any vireo eggs may have been such that the Cowbird did not reappear, and the fourth nesting was then completed successfully.

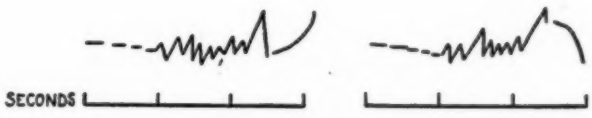
Parental Behavior

The period of nest building was marked by increased attention of the male towards the female. The male followed the female about almost continually, singing more frequently and with greater vigor than at other times of the breeding cycle. The female apparently built the nests unaided. Nice (1929: 16) states that the male may or may not assist in nest building. Both sexes incubated and both fed and brooded young. Nice (1929) and DuBois (1940) report similar observations. The sexes of other species of Vireonidae show similar relations in care of nest and young. The variation noted in the behavior of the male Bell's Vireo (Nice, 1929) is illustrated also in the Black-capped Vireo (*Vireo atricapillus*), the males of which may or may not participate in incubation (Lloyd, 1887: 295; Bunker, 1910: 72).

Song

The song as heard in central Illinois was almost identical with that recorded during earlier observations in southern Texas (Pitelka, 1938).

It is an iregular series of harsh and sharp, but slurred notes preceded by a few distinct notes of the same quality and ended with a decidedly ascending or descending note of similar harshness. Each song usually last three seconds. Two characteristic performances may be patterned as follows:



The notes are loud, emphatic, and unmusical. The last part of the song is loudest. Notes of the Rough-winged Swallow (*Stelgidopteryx ruficollis*), though less loud, are similar in quality.

As in other Vireonidae, a subdued version of the song may be given, and the male may sing intermittently during attentive periods on the eggs. Spaulding (1937: 22) states, however, that the male of Latimer's Vireo (*V. latimeri*) in Puerto Rico does not sing on the nest.

On July 2 (last day of incubation), the male sang 98 times during an early morning period of 1½ hours (6:22-7:50 A.M.). This averages approximately a song per minute, but as many as four or five songs were given per minute during brief periods of more frequent singing. Earlier in the breeding cycle, singing occurs more frequently (Nice, 1929: 13, 17). The male was noted to respond to the female with song during or following her scolding notes; this occurred when he was away from the nest as well as on the nest.

On July 2, Koestner recorded an exchange of place on the nest when, as the male left, the female approached and sang twice. The occurrence of female song in this species was not ascertained further (although suggestive evidence had been recorded on June 22 and 26). Song in female vireos has been reported in three other species: *V. atricapillus* (Lloyd, 1887: 295), *V. philadelphicus* (Lewis, 1921: 33), and *V. latimeri* (Spaulding, 1937: 18). In our observations and those of Lewis (1921: 33, 37), circumstances accompanying the singing by the female suggest that the song may function as a signal prior to exchange at the nest (Pitelka, 1940: 15). Spaulding, however, did not record female song beyond the courtship and nest building periods.

Nest Parasites

Both incubating adults and young apparently suffer infestation by the northern fowl mite, *Liponipsus sylviarum* (Can. & Franz.). On July 2, the adult bird on nest No. 4 pecked and scratched its breast while on the nest. The mites were numerous on the following day when

the young hatched. A heavier infestation was recorded at the nest of pair B, containing three young on July 11; on July 14, two young left the nest and a third was found dead in the nest. On July 15, the rim of this nest and adjoining twigs were covered with "thousands" of mites which dropped to the ground in a continual little shower.

Occurrence and Breeding Season in Illinois

In 1939, Bell's Vireo was first recorded on area A on May 17 (J. Murray Speirs). The male on area B was first noted on May 28 (Pitelka). The extreme dates of occurrence of this species in Champaign County are May 1 (Smith, 1930: 116) and September 5 (our records). (The male of pair A was last recorded singing on the home area on July 29; a male, probably that of pair B, remained singing on area B through September 5).

Previous nesting records for the state include those of Cory (1909) and Hess (1910). Eggs have been recorded from May 26 (our records) to July 4 (Hess, 1910: 29).

In east-central and northern Illinois, Bell's Vireo is apparently uncommon and local in distribution, but it is more numerous in the western and southern parts of the state. As a regular resident, the species ranges farthest east in the region of the prairie peninsula of central and northern Illinois.

Habitat Relations

The habitat occupied by the Bell's Vireos under our observation (Figures 1 and 2) was similar to sites described by other observers in Illinois (e.g., Hess, 1910: 29). The other resident species within area A were: Mourning Dove (*Zenaidura macroura*), Alder Flycatcher (*Empidonax traillii*), Catbird (*Dumetella carolinensis*), Brown Thrasher (*Toxostoma rufum*), Yellowthroat (*Geothlypis trichas*), Goldfinch (*Spinus tristis*), and Field Sparrow (*Spizella pusilla*). All of these are more or less characteristic of forest edge and growths of shrubs in this region.

In more arid portions of its range, such as western Nebraska and California, Bell's Vireo is confined largely to canyon-bottom and riparian shrub growths (Cary, 1901: 46; Grinnell and Storer, 1924: 515). Yet during field studies about Laredo, Texas (Pitelka, 1938), the species was noted in patches of mesquite (*Prosopis*) scattered over dry, open uplands.

Niche limitations confine Bell's Vireo to a low stratum of vegetation for nesting sites and food (Grinnell and Storer, 1924: 515). Individuals are seldom seen above six or seven feet in shrubby vegetation and their flights are usually made low over openings between thicket patches. As Grinnell and Storer have pointed out, other Vireonidae occurring in the same region as *V. belli* forage considerably above the six-foot level. But it is instructive to note a similarity of habitat of this and

other shrub-inhabiting vireos in areas where their ranges overlap. In southern Illinois, Ridgway (1873: 119) found Bell's Vireo within the same thickets as the White-eyed Vireo (*Vireo griseus*). In central Oklahoma, Bunker (1910: 72) found Black-capped Vireos nesting in the same thickets as Bell's Vireo. The study of interspecific relations among closely related forms occupying similar habitats has hitherto been neglected. Each of the two examples just mentioned provides an excellent opportunity to observers who are located favorably for such a study.

Summary

During the summer of 1939, five nests of Bell's Vireo were studied in central Illinois. These consisted of three attempts at nesting and a fourth successful nesting of one pair together with one successful nesting of a second pair. Nest building lasted 4 to 5 days. Incubation began after laying of the first egg and lasted 14 days. Nestling life lasted 11 days. Cowbird interference was probably the cause of desertion of the first two, and possibly three, nests of one pair. At each of these nests, desertion occurred after removal of one host egg. Nest building was done by the female. Both sexes participated in incubation and care of young. The female may sing. In Illinois, Bell's Vireo occurs in orchard thickets and groves of shrubby deciduous trees. It is known to occur in similar or the same habitats as two other shrub-inhabiting species of *Vireo* in regions where their breeding ranges overlap.

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THE SHARP-TAILED SPARROWS OF THE ATLANTIC COAST

BY WILLIAM MONTAGNA

DURING the month of June, 1939, while collecting birds in the vicinity of Popham Beach, Maine, I became especially interested in the Sharp-tailed Sparrow, *Ammospiza caudacuta*. A series of specimens indicated that this area was one of intergradation between the Acadian Sharp-tail, *A. c. subvirgata*, and the nominate race. In June, 1940, I collected Sharp-tails in New Jersey, and these birds, which should have been typical *A. c. caudacuta*, appeared to be dark-backed enough for *A. c. diversa*. Resolved to ascertain just where this last-named, southernmost race actually bred, I made trips to Delaware, Maryland, Virginia and North Carolina, in June and July, 1941. Accompanying me were Jim Fife (who also had been with me in New Jersey, in 1940) and H. Godwin Stevenson, Jr., who served as botanist. I want to express my appreciation to these men for helping me.

In the preparation of this paper I have received guidance from my friend George M. Sutton. The Museum of Comparative Zoology at Harvard University, Field Museum of Natural History, the U. S. National Museum, the Carnegie Museum, and the Museum of Natural History at the University of Minnesota have lent specimens for comparison. Louis B. Bishop, Ludlow Griscom, J. J. Murray, Arthur A. Norton, James L. Peters, Roger T. Peterson, Percy Taverner, Alexander Wetmore, and others have given me valuable information. To all the above-named men and institutions, I tender my thanks.

This paper deals primarily with the breeding distribution of these birds. I have divided the article into five sections on: breeding range, behavior of breeding birds, habitat, winter range, and relationship between Sharp-tailed Sparrows and Seaside Sparrows.

Breeding Range

Ammospiza caudacuta subvirgata.—This is the northernmost race of Sharp-tails which breeds on the Atlantic Coast. Dwight (1896) referring to this bird says that it is "peculiar to the fresh and salt water marshes of the Maritime Provinces of Canada, especially those bordering on the Bay of Fundy and the Gulf of St. Lawrence." Taverner (1927) records a specimen of this race taken at Kamouraska, which is situated on the south shore of the St. Lawrence River, eighty miles below Quebec city. Young (1931) found some Sharp-tails nesting on Grindstone Island (Magdalen Islands); unfortunately, however, no specimens were taken and I am allowing for the possibility of an error until more definite proof is given. Mr. J. L. Peters tells me that there are two sets of eggs in the Museum of Comparative Zoology taken at Goss Island,

Magdalen Islands, by E. Arnold in 1922. Arnold took no birds, only eggs and nests. It is difficult to accept such records since the eggs of Sharp-tails are much like those of Savannah Sparrows. Mr. Peters is inclined to believe that the two nests collected by Arnold look more like those of the latter bird. Brewster (1876) reported five specimens taken at Tignish, Prince Edward Island. Dwight (1887) declared these specimens and other Prince Edward birds *subvirgata*. Dwight did not report them from Nova Scotia, although Lewis (1920) found them there ". . . common in suitable localities." In our Cornell University collection we have a splendid series of adults and nestlings collected in Nova Scotia by Victor Gould at Grand Pré, Wolfville and Malassam, in King's County, and Chebaque Point, Yarmouth County. All of the birds were taken in July, 1927. In New Brunswick they are locally common, especially along the banks of the rivers which empty into the Bay of Fundy. Dwight (1887) designated Hillsborough, New Brunswick as the type locality for *subvirgata*.

Ludlow Griscom, in a recent letter to me commenting on the nesting of this bird in Maine, says that the salt marshes in that state are ". . . very small in area and are restricted to small patches at the mouths of the larger rivers and estuaries. Experience has proved that careful search shows that some Sharp-tails can be found in every one of these situations." Just in such situations as these Norton (1897 and 1927) and I (Montagna, 1940) found them in well populated colonies.

Norton (1897) suggests that north of Scarborough, Maine, it was unlikely that one would find typical *caudacuta*, because the ". . . physical features of the coast are such as to suggest the improbability of the normal range extending beyond this town." This is correct, and the fact that I took a typical *caudacuta* as well as *subvirgata* at Popham Beach substantiates the belief that this is the area of intergradation.

Norton (1897) describing the thoroughly different nature of the habitat of *subvirgata* as contrasted with that of *caudacuta* in Maine, says: "North of Scarboro, beginning with Cape Elizabeth, its eastern boundary, the coast presents an uneven or hilly face of rocks indented with coves and bays, studded with dry ledgey islands. Between the hills are innumerable arms of the sea often extending as 'tide rivers' or fjords several miles inland, bordered by narrow swales rather than broad expanses of marsh." The marshes of Popham Beach are of that description. They are surrounded by jagged, spruce-clad hills so close to the marsh that as I stood in the middle of it I could hear Hermit Thrushes (*Hylocichla guttata*) and Olive-sided Flycatchers (*Nuttallornis borealis*) singing.

It is interesting to note in *subvirgata* a tendency to frequent brackish or even fresh-water marshes. In Maine, there is a gradual transition from the broad, strictly salt-water marshes in the western portion of the state to brackish ones as one progresses eastward. This is natural be-

cause to the east, the only marshes to be found are at the mouths of rivers. Farther north, in New Brunswick and Quebec these birds become even more fresh-water-loving and Dwight (1887) calls attention to this fact in his description of *subvirgata*. He says: "One accustomed to the salt marshes where *caudacuta* makes its home would never dream of finding its northern relative inhabiting fields where grass is knee deep, and where the Bobolink and Savannah Sparrow find it dry enough to make their nests. And yet, this is the character of the marshes along the Petitcodiac River," New Brunswick, "where I have found the birds in considerable numbers." The habitat that Dwight described is possibly not altogether typical, but certainly one does not find the other coastal races of this species in such places. Thus we see a gradual transition from birds inhabiting salt-water marshes in western Maine to those in freshwater habitat along the Petitcodiac River and Kamouraska on the St. Lawrence. There is little doubt that *subvirgata* represents the closest eastern relative of the James Bay birds (*altera*) recently described by Todd (1938). I am not well enough acquainted with the northern representatives of *subvirgata* to know how closely they resemble *altera*. If *subvirgata,* indeed, is the closest race to *altera* it would be interesting to know where the area of intergradation occurs. Since the northern *subvirgata* are found in fresh-water marshes, it is possible that some colonies may be nesting inland along the southern portion of the Labrador Peninsula. This area, which extends about 500 miles from James Bay to the mouth of the St. Lawrence River, is studded with lakes and rivers and suitable marshes may be quite abundant.

A. c. caudacuta.—While collecting Acadian Sharp-tailed Sparrows (*A. c. subvirgata*) at Popham Beach, Maine, I took a breeding female *caudacuta* in the midst of a well populated colony of the former race. (Montagna, 1940) The discovery is not very remarkable when one realizes that 35 miles to the southwest, at Scarborough, *caudacuta* nests regularly. Some of the specimens of *subvirgata* from Popham Beach are definite intermediates between the two races, although the majority of them prove to be good *subvirgata*. So, then, the area between the two localities mentioned above may be considered the area of intergradation. In Maine, *caudacuta* has been found nesting only at Scarborough, Wells, and Kittery. In these places the habitat is much different from that found north of Scarborough. The marshes become more wide and spacious as one proceeds southward. So, with the widening of the marshes the birds become more common and more generally distributed, and along the New Hampshire coast they are found in good numbers. Griscom says, "One of the curious things about the Sharp-tailed Sparrow that is striking in my own field experience with every described form is that as you proceed northward the bird tends to become local. In a good salt marsh on the south shore of Long Island, for instance, Sharp-tails are ubiquitous and abundant. By the time you reach the coast of

Massachusetts north of Boston, enormous areas of salt marsh like Plum Island meadows, between Ipswich, Rowley, and Newburyport, for no known reason the Sharp-tail is not ubiquitous. There will be a colony here and there along the bank of some tidal creek, when for all you can see, the Sharp-tails might just as well as not be up and down the entire length of the creek."

Their numbers increase as one proceeds southward to Rhode Island, Connecticut, and New York. Along the New York coast, including Long Island, the birds are extremely abundant, and it does not seem extravagant to consider this state, in spite of its limited coast line, as the center of abundance of these birds. Here one finds the "mean" of the species. By "mean" I wish to point out that specimens of nesting birds taken from this general area are very typically colored *caudacuta,* which are not as dark as the race to the south, *diversa,* not as pale as the adjacent race to the north, *subvirgata,* not as brightly colored as the inland race, *nelsoni.*

Along the New Jersey coast Sharp-tailed Sparrows are very common. Stone (1909) lists the birds as "Abundant summer resident on the salt meadows of the coast and Delaware Bay. . . ." In June, 1940, Jim Fife and I found them common along the coast of Ocean County. They were especially abundant at Tuckerton, in the southern part of Ocean County. Yet, although apparently suitable marshes were found on Long Beach and Island Beach, our searches there were fruitless. Just south of Tuckerton on the vast marshes on the promontory which projects between Little Egg Bay and Great Bay they were found only in scattered numbers and never very far from the drainage ditches near the water. From Tuckerton we took a fine series of specimens.

These proved to be of unusual interest because among typical *caudacuta* are several birds which are referable to the southern race, *diversa.* These are ". . . dark highly colored . . ." birds (Bishop, 1901a), comparable to the birds from farther south. Some of the birds in this series are undoubtedly intermediates between the two races. I have not seen birds from Delaware Bay but they are, probably, *diversa.*

Ammospiza caudacuta diversa.—Hellmayr (1938) defines the breeding range of this race as "in the salt marshes of the Atlantic Coast of the United States from Maryland to North Carolina."

In late June and July, 1941, Jim Fife, H. Gordon Stevenson, Jr., and I surveyed the coast of Delaware, Maryland, Virginia, and North Carolina for nesting Sharp-tails. In Delaware we found no birds until we reached Lewes. They were not common, however, and we did not collect any. They were more numerous at Rehoboth Beach and at Bethany Beach. Birds collected from these localities are definitely of the race *diversa.* We proceeded southward from Bethany Beach, stopping at constant intervals along the vast uninterrupted stretch of marsh of the eastern coast of the Delmarva Peninsula. Not until we arrived at Saint George's Landing in northern Maryland did we find any more birds.

This was a colony of several hundred birds. Other Sharp-tails were found farther south at Cornfield Harbor and Ocean City. We came across no other colonies in Maryland.

In Virginia we found a populous colony in the northern portion of the state, at Chincoteague Island. These marshes were vast and birds could be found nearly everywhere among them. The fine series collected at this point represents our southernmost specimens.

From Chincoteague we went southward to Cape Charles, at the tip of the peninsula and we visited *all* of the marshes along the way. From Cape Charles we went across to Norfolk, then to Cape Henry, Virginia Beach and Back Bay without finding any Sharp-tailed Sparrows. We went on to North Carolina along the Currituck Sound, investigating the endless expanses of marsh all along the way. We then proceeded to Roanoke Island, the type locality of *diversa* (Bishop, 1901b). Here, at least, we expected to find nesting birds. But the marshes around Wanchese, the type locality, were all coarse and brown, and the vegetation was either entirely submerged or too dry. The island is perhaps seven miles long, and during the three days that we remained there we searched its marshes thoroughly. There were no Sharp-tailed Sparrows to be found, nor were there any on Pea Island, a marshy island not far from Roanoke. We went on down as far as the mouth of the Neuse River at the south end of Pamlico Sound. All this was fruitless. I am now convinced that there are no breeding Sharp-tailed Sparrows in North Carolina.

Bishop (1901b) lists specimens taken on May 10 and May 11 from Roanoke Island. It has been concluded from this that these birds were breeding birds. Yet, it must be remembered that Sharp-tails are notorious laggards in their migratory movements. Bishop himself did not believe that the birds nested there, and in a recent letter he tells me that "Roanoke Island does not show country suitable for the breeding of this species . . . but Pea Island does . . .," "1901 . . . was, I think, my first visit to Pea Island. Subsequent visits I made there on spring dates failed to give me any later birds, and I finally concluded the race did not breed there, but further north. But I failed to find it on Charles Island, Virginia, the spring I was there. . . ."

Investigation of the records of breeding Sharp-tails in Virginia convinces me that these birds are found only in the northern portion of that state, and that Chincoteague Island is either the southern or nearly the southern limit of breeding Sharp-tailed Sparrows. Rives (1889–1890) says of this bird in Virginia that it was a "rather common summer resident, and breeds at Cobb's Island." Yet, Dr. J. J. Murray tells me that they ". . . seem to be nonexistent or at least very rare on the Virginia coast except in the northern section." Dr. Murray goes on to tell me that Alexander Sprunt spent six weeks at Cobb's Island in the early summer of 1940 without finding any of these birds. In June 1941, Dr. A. A. Allen, William A. Wimsatt, and I searched the marshes of Hog

Island (adjacent to Cobb's Island), Rogue Island and Little Machipongo Island. No birds were found. H. H. Bailey (1913) calls attention to the fact that in Virginia these birds ". . . breed more abundantly along the salt marshes of the northwestern side of the Chesapeake Bay than on the Cape Charles Peninsula or coastal islands. . . ." Unfortunately, I have found no other references to the Chesapeake Bay region, and Mr. Bailey is very vague in his information. It is entirely possible, however, that appropriate marshes along the Bay harbor colonies of Sharp-tails.

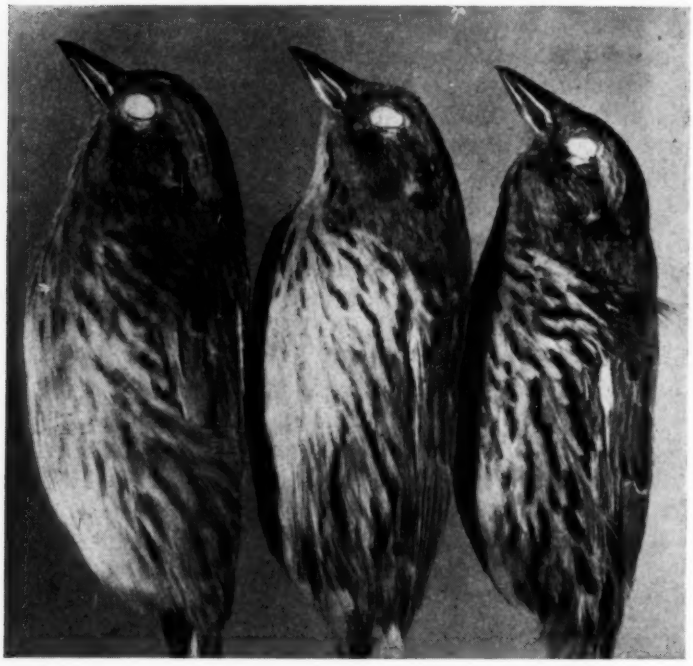

Figure 1. The three races of Sharp-tailed Sparrow that nest on the Atlantic coast. From left to right: *Ammospiza caudacuta subvirgata, caudacuta, diversa.* Note the increase in amount and sharpness of the streaking. (Photograph by Charles S. Brand.)

Ammospiza c. diversa, with its dark upper parts, is a well marked form. Realizing how really distinct the race is, one is rather surprised to find that it was not accepted by the A. O. U. Checklist, Fourth Edition. Oberholser (1931) defended the validity of this race, and I am sure that it will be generally accepted as it becomes better known.

Habitat

The study of the type of habitat chosen by these birds is interesting. The general character of the marshes is more or less similar for all three of the races, whether in Maine or Maryland. These marshes are usually well drained, although they may be subjected to slight daily flooding by tides. The tidal water must not, however, come above the base of the grasses since these birds build their nests on the roots of the thick

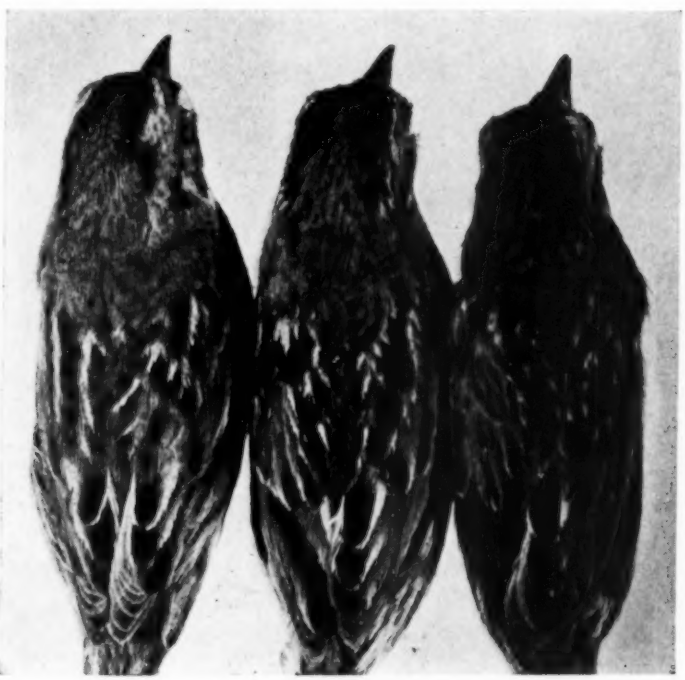

Figure 2. Dorsal view of the specimens of Figure 1. Same sequence. (Photograph by Charles S. Brand.)

mattings of grasses. The nests are suspended among the bases of the grasses only a few inches from the wet muck. To be sure, many of the nests are occasionally destroyed by sudden unusually high tides. Lewis (1920) in his study of the nesting of *subvirgata* in Nova Scotia makes interesting observations of the correlation of the height of spring tides and time of nesting. In closing he says "It would be interesting to know . . . if the birds, when nesting in salt marshes take into account the variation in the rise and fall of the tides. . ."

The Maine marshes, although they were restricted in area, offer an ideal condition for nesting. These were thoroughly and thickly covered by soft marsh grasses, the most common being *Spartina alterniflora, Spartina patens, Juncus Gerardi,* and *Triglochin maritima.* These marshes were flooded at high tide, but never did I find more than one or two inches of water where the birds were nesting.

Figure 3. Marsh near Popham Beach, at the mouth of the Kennebec River, Maine. This is typical habitat of the Acadian Sharp-tailed Sparrow. (Photograph by Ralph S. Palmer.)

The New Jersey marshes resembled those of the Maine coast. But the birds were nesting in slightly elevated "islands" scattered here and there along the immense marshland. These "islands" showed signs that they were occasionally slightly submerged, but they were comparatively dry, having a luxuriant growth of *Distichlis spicata,* and *Spartina patens,* whereas the surrounding muckier marshes had a sparser, coarser and taller vegetation with a predominance of *Scirpus* sp. and *Juncus Gerardi.* Yet, south of Tuckerton, along the drier marshes which extended miles in width no birds were found away from the shore. These marshes were possibly too dry. The birds preferred the slightly elevated "islands" toward the ocean side to all other habitats.

The marshes inhabited by Sharp-tails on the eastern side of the Delmarva Peninsula were well drained and green. The grasses were thick, soft, and seldom over a foot in height. At Chincoteague, Virginia, the habitat was most suitable and birds were very numerous.

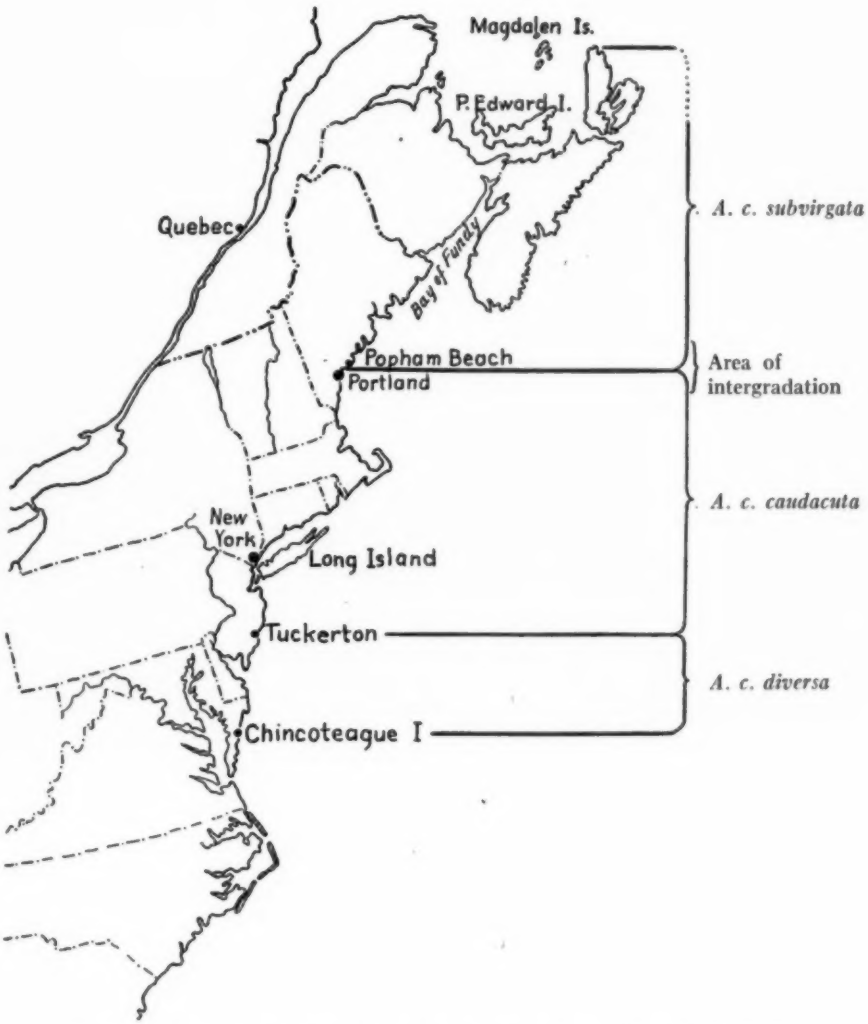

Figure 4. Map of the breeding ranges of the eastern Sharp-tailed Sparrows.

But again drainage alone did not seem to be the determining factor, for here and there were found large equally suitable areas devoid of birds. At Bethany Beach, Delaware, they were found along narrow strips

of marsh flanking the narrow tongues of sea which project inland. The birds were found only along the edge of the marsh toward the water or along the tidal pools close to the main bodies of water. These marshes were very restricted and became dry only fifty yards away, where elderberry (*Sambucus* sp.) was common. So, within 25 yards one found habitats suitable for Sharp-tails on the marshy side and Grasshopper Sparrows and Henslow's Sparrows on the dry land.

H. Godwin Stevenson, Jr. made the following list of the plant association found in marshes inhabited by Sharp-tails along the Delaware, Maryland, and Virginia coasts. *Distichlis spicata* (very abundant), *Spartina patens, Spartina glabra* (most abundant), *Scirpus americanus* and *S. robustus,* abundant.

It was evident that as one progressed southward the coastal marshes lost the meadowy appearance and became coarse, tall, and sparse. They were either submerged or entirely dried out. *Juncus Roemerianus,* a tall very coarse brown weed, was perhaps the predominant plant. Plants found dominant only where there were no Sharp-tails were *Salicornia europea* and *Eleocharis.*

Behavior of Breeding Birds

All of the three races of this species, with which I am familiar, are unusually quiet birds. With the exception of the "song" of the male, they utter short, retiring chips only infrequently. The Maine birds were the most frequent singers. A male bird would sing again and again; often within the area of one hundred square yards a dozen or more birds could be seen in the air, fluttering and descending, their song sounding like a gasp. In New York and New Jersey, however, the males were a little more quiet. I have watched these birds from the earliest hours of the morning to late evening, and only rarely could I see more than one bird in the air, and seldom could I hear more than three or four songs at one time, although male birds were all around me. The New Jersey birds had two distinct songs. One was the typical song of these birds, a hiss or gasp; the other resembled that of its close cousin, the Seaside Sparrow (*Ammospiza maritima*). The race *diversa* chirps more frequently than *subvirgata* and *caudacuta.* When they were feeding young they scolded occasionally at our intrusion and often, when we squeaked for them they chirped softly but repeatedly. Also, the occasional flight songs of *diversa* which I witnessed did not seem as spectacular as those of the other races to the north. The males rose only twenty or so feet in the air, uttering the song repeatedly, in the ascent as well as the descent. The song too, seemed to be harsher and more varied than that of *caudacuta* and *subvirgata.*

In Virginia when we flushed birds they often flew to a reed and began chipping softly. They were many times immediately assailed by

one or more birds which made their appearance from the grass. Together they often rolled to the ground in a tangled, fighting mass. There they remained fighting almost silently, often flapping, or perhaps chirping softly. In Maine, with *subvirgata,* I made observations somewhat like this. However, there I was able to confirm to my satisfaction that these were birds fighting over a female. With the southern birds there seemed to be a different story; twice I collected these "fighting" birds, none escaping, and they all proved to be males.

The diet of the southern Sharp-tails consists almost entirely of blackish spiders which are very abundant among the marsh grasses. The gizzards of birds collected were full of spiders and evidently the parent birds were feeding them to the young.

Winter Range

One of the interesting things about Sharp-tails is that all of the races may be found wintering together along the coast of the southern states. The most notable locality for their congregation is Amelia Island, Florida, where not only the three Atlantic Coast birds are found, but also the other two races of this species, the western inland form, *nelsoni,* and the James Bay one, *altera.* Sharp-tails winter from Massachusetts south to Florida, North Carolina and South Carolina being their centers of abundance.

Ammospiza caudacuta nelsoni.—I have examined several specimens unmistakably of this race from the Gulf Coast and Florida, as well as some from South and North Carolina. One bird from Cobb's Island, Virginia, marks the northernmost wintering locality known to me. The specimen was examined carefully and compared with breeding specimens from Minnesota. Since I have only scanty data, and the many sight records in the literature are of no value, I shall not try to interpret the migratory movements of this race. It will suffice to say that *nelsoni* does occur on the Atlantic coast, perhaps in greater numbers than has been realized.

Ammospiza caudacuta altera.—It is almost certain that many of the east coast birds which for the past years have been called *nelsoni* are actually *altera,* which Todd (1938) described from James Bay. There has been some discussion as to the validity of this race, and since Mr. Todd was good enough to show me his entire James Bay series I want to say that on the basis of these birds, contrasted with specimens from Saskatchewan, the race seems perfectly acceptable. Examination of a large number of migrant birds from Amelia Island, Florida, and Pea Island, North Carolina, convinces me that this race deserves recognition. Our series of locally collected specimens at the Cornell University Museum is made up almost entirely of young birds of this race. Sharp-tails are reported in Ithaca, New York, nearly every year, from September 23 to October 28. I am sure that should closer search be made these birds

would be found in some numbers in autumn along the inland marshes south of the Great Lakes. These birds are practically never recorded inland during the spring migration, and secretive as they are, they are not easily seen even on the coast. Harry Hathaway tells me that he has observed them in large numbers along the Long Island and New York coasts for many springs.

That *altera* winters at Amelia Island, Florida, Mt. Pleasant, South Carolina, and Dare County, North Carolina is substantiated by specimens. Doubtless some may be found wintering all along the coast as far north as New York.

Ammospiza caudacuta subvirgata.—It may be assumed that *subvirgata* migrates southward in the fall primarily along the coast. For lack of other evidence we must accept this, although I am of the opinion that these birds, which, in their nesting habitats show a transition from salt to fresh-water marshes, do not altogether follow the coast. I also believe that if careful search were made they would be found along our inland marshes. Two specimens in our Cornell University collection, collected by Louis A. Fuertes at Ithaca, are of this race. Burch (1897) took a bird in Yates County, New York, which Dwight identified as *subvirgata*. The literature is full of inland sight records, which one may doubt, but Dwight's identification of the Yates County specimen was doubtless correct. Also, Wetmore and Lincoln(1932) took a specimen somewhat inland at Cornfield Harbor. The main wave of migration occurs along the coast, where wintering *subvirgata* have been found from New York to Florida. The preferred wintering quarters are South Carolina and Florida.

Ammospiza caudacuta caudacuta.—These birds are strictly marine and have never, to my knowledge been reported inland. They proceed southward along the coast, a few of them wintering all along the breeding grounds. They have been reported wintering from Massachusetts to Florida. Their numbers in the winter increase from Virginia southward, being particularly abundant in the Carolinas and Florida. In April, 1941, William A. Wimsatt and I found them in fair numbers at Hog Island and Rogue Island, Virginia.

Ammospiza caudacuta diversa.—Specimens of this race taken from North Carolina prove that they winter there in abundance. They have been taken also from South Carolina, Georgia, and Florida, as far south as Amelia Island. In April, 1941, Wimsatt and I found three in the marshes of Hog and Rogue Islands, Virginia; *caudacuta* was far more common.

Relationship Between the Sharp-tail and Seaside Sparrows

Since these species live side by side in the salt marshes there would seem to be a natural competition for survival. However, as one begins to understand the birds' preference for habitat one realizes that such

competition is largely avoided; perhaps the only real rivalry between them is in their search for food, both species feeding on small aquatic and semi-aquatic arthropods. It is in their choice of nesting sites and territory that the two birds differ most markedly. I have already discussed the nesting of the Sharp-tails. The Seaside Sparrows nearly always place their nests on tussocks of grasses which are usually growing from shallow water, the nests being a foot or so from the level of the water. The coarse, brown, flooded marshes of southern Virginia and the Carolinas are the ideal habitat of Seasides, which may be found there in great numbers.

Generally speaking, the behavior of the two birds is similar. In New Jersey I witnessed Seasides fluttering up into the air in the manner of the song-flight of the Sharp-tails. This behavior was observed again in North Carolina. It was not a true song-flight like that characteristic of the other species, but there is enough similarity to remind one of it.

I have often wondered about the more intimate relationships of these birds. They resemble each other in general appearance and in their habits. I had rather hoped that with extensive collecting I might some day take a bird which showed signs of intergradation between the two species. In June, 1940, at Tuckerton, New Jersey, I collected a male Sharp-tail and a female Seaside while they were in copula on a tussock of grass.

Summary

The Acadian Sharp-tailed Sparrow, *Ammospiza caudacuta subvirgata,* is found nesting as far north as Kamouraska on the Gulf of St. Lawrence, and there are sight records even from the Magdalen Islands. This race breeds southward all along the coast to Popham Beach, Maine, where intermediates with *caudacuta* are found. *A. c. caudacuta* breeds from Portland, Maine, to southern New Jersey, becoming particularly abundant along the coast of New York, and especially Long Island. Tuckerton, New Jersey, is in the area of intergradation of this race with *diversa. A. c. diversa* breeds south of Tuckerton, New Jersey, in the marshes of the Delaware Peninsula, and along the coast of Delaware, Maryland, and northern Virginia, to Chincoteague Island. This is the southernmost known locality of their breeding distribution.

New York is without doubt the center of breeding abundance of this species. As one progresses northward and southward the birds become more local in their distribution.

All the five races of the species may be found wintering along the Atlantic Coast. Their wintering range extends from Massachusetts to Florida, North Carolina and South Carolina being the centers of abundance. *A. caudacuta nelsoni* has been found in the winter from Cobb Island, Virginia, to Florida; *altera* is found regularly from New York City to Amelia Island, Florida; *subvirgata* has also been reported in

New York, and south to Amelia Island, Florida. Typical *caudacuta* may winter all along its breeding range, south to Amelia Island. This race is often recorded from Massachusetts. *A. caudacuta diversa* winters south from Hog Island, Virginia, to Amelia Island, Florida.

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To the Editor of the Wilson Bulletin:

Now that fourteen of my Bulletins on the "Life Histories of North American Birds" have been published, your readers may be interested to know what progress is being made on future volumes.

The manuscript for the fifteenth, on the Corvidae and Paridae, has long since been completed and is in the hands of the publishers in Washington.

My work on the sixteenth, containing the birds on the 1931 Checklist from the nuthatches to the thrashers inclusive, is practically done, except for a few minor details.

I am now starting work on the seventeenth volume, which is planned to include the birds on the 1931 Check-list from the thrushes to the vireos inclusive.

It is planned to accumulate manuscript in advance of publication, which may be retarded under the present war conditions.

I wish to take this opportunity to thank all those who have contributed material for previous volumes, to remind them that this is a co-operative work, and to ask them to send me, as soon as possible, contributions of notes, data and photographs relating to birds to be included in the seventeenth volume; the sooner these are received, the easier it will be for me to use them.

140 High Street, Sincerely yours,
Taunton, Mass. A. C. BENT

FLIGHT AND RUNNING SPEEDS OF BIRDS

BY CLARENCE COTTAM, CECIL S. WILLIAMS AND CLARENCE A. SOOTER

ONE of the chief characteristics and most fascinating accomplishments of birds is their remarkable degree of mobility. This quality undoubtedly has had high survival value in their evolution. Obviously, there is great variation among individuals of a species or even within the same flock or covey. As might also be expected, there is a vast difference between the normal cruising and feeding speed and the maximum speed; each of these probably varies under a wide range of conditions. In addition to the will for speed at any particular moment, wind direction and velocity, angle of flight in relation to the earth, the age and physical condition of the bird, the state of its plumage, and other factors modify the speed of the bird.

The topics of flight speed, altitude attained, and the mechanics or aeronautics of flight have already been the subject of considerable conjecture and observation. Specific data on flight and running speeds may prove of value to the investigator of predator-prey relationships. The subject of flight speed is best summarized by May Thacher Cooke in U. S. Department of Agriculture Circular No. 428, entitled "Flight Speed of Birds", issued in May, 1937. Relatively few running speeds have been recorded.

In the course of field work in various parts of the West, we have been able to time a number of birds whose flight or running speeds have never been recorded and to add to the rather limited data on record for others. All records were made by automobile, from which two or more observers usually checked the speeds. Our data are summarized in Tables 1 and 2. The bird names used are those of the A.O.U. Checklist (1931).

TABLE 1

FLYING SPEED OF BIRDS

Species	Miles per hour	Place	Date	Distance covered	Observer	Remarks
Double-crested Cormorant	22	Malheur Refuge, Oregon	6/29/41	200 yds.	C. C. C. S. W. C. A S.	Cruising
Great Blue Heron	18, 24, 25, 29	Bear River Bird Refuge, Utah	7/21-24/41	200 yds.	C. C. C. S. W.	Cruising
Great Blue Heron	36	Bear River Bird Refuge, Utah	7/26/41	200 yds.	C. C. C. S. W.	No favoring wind, bird pressed
Great Blue Heron	20	Malheur Refuge, Oregon	7/21/41		C. C. C. S. W. C. A. S.	Cruising
Black-crowned Night Heron	20	Malheur Refuge Oregon	6/29/41	200 yds.	C. C. C. S. W. C. A. S.	Cruising
Black-crowned Night Heron	18	Malheur Refuge, Oregon	10/13/41	450 yds.	C. A. S.	No wind; 3 juveniles
Black-crowned Night Heron	35	Bear River Bird Refuge, Utah	7/23/41		C. C. C. S. W.	Paralleling car; being pressed some
Snowy Egret	30	Bear River Bird Refuge, Utah	7/23/41		C. C. C. S. W.	Bird pressed
White-faced Glossy Ibis	30, 33	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	Cruising
Whistling Swan	25	Currituck Sound, North Carolina	Nov. 1933	450 yds.	C. C.	Six birds flying 18 to 25 miles per hour

Canada Goose	20	Currituck Sound, North Carolina	Nov. 1933	200 yds.	C. C.	Cruising, easy flight
Canada Goose	26	Bear River Bird Refuge, Utah	7/21/41	200 yds.	C. C. C. S. W.	In front of car
Mallard	40	Bear River Bird Refuge, Utah	7/21/41	200 yds.	C. C. C. S. W.	Bird being pressed
Gadwall	29	Malheur Refuge, Oregon	6/29/41	200 yds.	C. C. C. S. W. C. A. S.	Cruising
Baldpate	22	Malheur Refuge, Oregon	6/29/41	100 yds.	C. C. C. S. W. C. A. S.	Gliding to alight
Pintail	49	Bear River Bird Refuge, Utah	7/26/41	½ mile	C. C. C. S. W.	Juvenile, being pressed
Green-wing Teal	30, 40	Bear River Bird Refuge, Utah	9/14/41	½ mile	C. C. C. S. W.	Cruising and being pressed, respectively
Cinnamon Teal	50	Bear River Bird Refuge, Utah	7/23/41	½ mile	C. C. C. S. W.	Male; being pressed
Cinnamon Teal	33	Malheur Refuge, Oregon	6/29/41	200 yds.	C.C. C. S. W. C. A. S.	Cruising
Shoveller	25	Malheur Refuge, Oregon	6/29/41	200 yds.	C. C. C. S. W. C. A. S.	Not exerting itself
Shoveller	50	Bear River Bird Refuge, Utah	9/17/41	200 yds.	C. C. C. S. W.	Pressed
Redhead	45	Bear River Bird Refuge, Utah	9/14/41	200 yds.	C. C. C. S. W.	Pressed, but attempting to light; erratic flight
Redhead	50, 55	Bear River Bird Refuge, Utah	7/23/41	200 yds.	C. C. C. S. W.	Pressed

Species	Miles per hour	Place	Date	Distance covered	Observer	Remarks
Redhead	31	Bear River Bird Refuge, Utah	7/23/41		C. C. C. S. W.	Cruising
Redhead	50, 51	Bear River Bird Refuge, Utah	7/26-28/41		C. C. C. S. W.	Female; being pressed
Buffle-head	48	Bear River Bird Refuge, Utah	10/24/41	3 miles	C. S. W.	Three females
Buffle-head	40	Malheur Refuge, Oregon	12/12/41		C. A. S.	Slight cross wind hindering flight (Blitzen River)
Sharp-shinned Hawk	28	Malheur Refuge, Oregon	10/3/41	525 yds.	C. A. S.	No wind
Cooper's Hawk	28	Bear River Bird Refuge, Utah	9/14/41	100 yds.	C. C. C. S. W.	Female
Ferruginous Roughleg	30–35	Red Rock Refuge, Montana	9/16/41	450 yds.	C. C. C. S. W.	
Prairie Falcon	30	Malheur Refuge, Oregon	11/8/41	175 yds.	C. A. S.	No wind
Osprey	25–27	Parramore Island, Virginia	8/23/35	450 yds.	C. C.	Flying along beach
Duck Hawk	40	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	Cruising
Sparrow Hawk	30–39	Warner Valley, Oregon	6/30/41	200 yds.+	C. C. C. S. W.	Cruising
Sharp-tailed Grouse	28, 30, 33	Des Lacs, North Dakota	7/28/41	50 yds.+	C. C. R. G.	
Sharp-tailed Grouse	22	Faith, South Dakota	8/18/41		R. G.	

Sage Grouse	28	Alturas, California	7/2/41	50 yds.	C. C. C. S. W.	Flushed, flying in front of car
Sandhill Crane	31	Malheur Refuge, Oregon	3/18/41	700 yds.	C. A. S.	Fair breeze hindering flight
Sandhill Crane	35	Malheur Refuge, Oregon	8/22/41		C. A. S.	No wind
Western Snowy Plover	30	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	Apparently cruising speed
Killdeer	25	Malheur Refuge, Oregon	6/29/41	50 yds.	C. C. C. S. W. C. A. S.	Flying zigzag
Long-billed Curlew	50	Bear River Bird Refuge, Utah	6/26/41	450 yds.	C. C. C. S. W.	Flying in front of car
Long-billed Curlew	35, 40, 45	Malheur Refuge, Oregon	6/29/41	100 to 200 yds.	C. C. C. S. W. C. A. S.	No exertion in evidence
Spotted Sandpiper	23	Malheur Refuge, Oregon	6/29/41	50 yds.	C. C. C. S. W. C. A. S.	Apparently cruising
Spotted Sandpiper	21, 25, 30	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	Apparently cruising
Western Willet	35, 39, 40	Bear River Bird Refuge, Utah	7/21/41	50 to 200 yds.	C. C. C. S. W.	
Western Willet	45, 47	Bear River Bird Refuge, Utah	7/23-24/41	200 yds.	C. C. C. S. W.	Small flocks of 3 and 12 birds
Forster's Tern	10	Bear River Bird Refuge, Utah	7/24/41	200 yds.	C. C. C. S. W.	Cruising
Common Tern	28	Parramore Island, Virginia	8/23/35		C. C.	Cruising along ocean beach

Species	Miles per hour	Place	Date	Distance covered	Observer	Remarks
Black Tern	21, 23	Malheur Refuge, Oregon	6/29/41	100 yds.	C. C. C. S. W. C. A. S.	Cruising
Black Tern	10	Bear River Bird Refuge	7/24/41	50 yds.	C. C. C. S. W.	Cruising
Black Skimmer	10	Parramore Island, Virginia	8/23/35	200 yds.	C. C.	Cruising
Black Skimmer	30	Parramore Island, Virginia	8/23/35	200 yds.	C. C.	Flock of 12
Great Horned Owl	40+	Malheur Refuge, Oregon	10/27/41		C. A. S.	Slight wind aiding flight
Burrowing Owl	12	Malheur Refuge, Oregon	6/29/41	40 yds.	C. C. C. S. W. C. A. S.	Cruising or feeding flight
Short-eared Owl	15, 19, 25	Malheur Refuge, Oregon	6/28–29/41	20 to 50 yds.	C. C. C. S. W. C. A. S.	No wind
Short-eared Owl	26	Malheur Refuge, Oregon	10/7/41		C. A. S.	No wind
Red-shafted Flicker	28	Malheur Refuge, Oregon	6/29/41	50 yds.	C. C. C. S. W. C. A. S.	Cruising; no wind
Red-shafted Flicker	27	Malheur Refuge, Oregon	11/20/41		C. A. S.	
Red-shafted Flicker	28	Malheur Refuge, Oregon	12/6/41		C. A. S.	

Red-shafted Flicker	29	Upper Souris, North Dakota	7/28/41	400 yds.	C. C.	Cruising
Violet-green Swallow	28	Malheur Refuge, Oregon	6/29/41	50 yds.	C. C. C. S. W. C. A. S.	Cruising in zigzag
Cliff Swallow	29	Malheur Refuge, Oregon	6/29/41	50 yds.	C. C. C. S. W. C. A. S.	Cruising in zigzag; 2 separate records
American Magpie	20	Malheur Refuge, Oregon	10/9/41		C. A. S.	Favored by wind
American Magpie	22	Malheur Refuge, Oregon	10/13/41	250 yds.	C. A. S.	No wind
American Magpie	22	Malheur Refuge, Oregon	11/7/41	175 yds.	C. A. S.	No wind
Western Raven	35	Malheur Refuge, Oregon	7/23/41	100 yds.	C. C. C. S. W. C. A. S.	Flying along dike.
Western Raven	39	Red Rock Refuge, Montana	9/16/41		C. C. C. S. W.	
Crow	30	Red Rock Refuge, Montana	9/16/41		C. C. C. S. W.	Small flock
Sage Thrasher	29	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	Cruising
Sage Thrasher	22	Warner Valley, Oregon	6/30/41	100 yds.	C. C. C. S. W.	
Sage Thrasher	25, 28	Malheur Refuge, Oregon	6/29/41	100 yds.	C. C. C. S. W. C. A. S.	Flying erratically in front of car
Western Robin	25	Malheur Refuge, Oregon	11/5/41	175 yds.	C. A. S.	No wind

Species	Miles per hour	Place	Date	Distance covered	Observer	Remarks
Mountain Bluebird	18	Malheur Refuge, Oregon	12/6/41	Short distance	C. A. S.	Cross wind
Townsend's Solitaire	20	Malheur Refuge, Oregon	3/9/41	350 yds.	C. A. S.	No wind
Sprague's Pipit	28	Des Lacs Refuge, North Dakota	7/28/41	30 yds.	C. C.	In front of car
California Shrike	22	Malheur Refuge, Oregon	11/30/41		C. A. S.	
Yellow Warbler	22	Mud Lake Refuge, Minnesota	8/23/41		C. C.	Easy flight.
Western Meadowlark	26	Red Rock Refuge, Montana	9/16/41		C. C. C. S. W.	
Yellow-headed Blackbird	29	Upper Souris, North Dakota	7/29/41		C. C. R. G.	Single bird
Yellow-headed Blackbird	25	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	Single bird
Yellow-headed Blackbird	20	Malheur Refuge, Oregon	6/29/41	75 yds.	C. C. C. S. W. C. A. S.	Cruising
Yellow-headed Blackbird	30, 35	Bear River Bird Refuge, Utah	7/23/41	350 to 700 yds.	C. C. C. S. W.	75 birds in flock. Cruising
Brewer's Blackbird	29	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	
Brewer's Blackbird	28	Warner Valley, Oregon	6/30/41	100 yds.	C. C. C. S. W.	Cruising
Savannah Sparrow	23	Bear River Bird Refuge, Utah	7/21/41		C. C. C. S. W.	Cruising

Savannah Sparrow	27	Malheur Refuge, Oregon	6/29/41	100 yds..	C. C. C. S. W. C. A. S.	In front of car
Savannah Sparrow	21	Malheur Refuge, Oregon	6/28/41	About 100 yds.	C. C. C. S. W. C. A. S.	Three separate records
Savannah Sparrow	20–21	Currituck Sound, North Carolina	Nov., 1935		C. C.	Cruising
Shufeldt's Junco	26	Malheur Refuge, Oregon	12/3/41	Short distance	C. A. S.	
Modoc Song Sparrow	30	Malheur Refuge, Oregon	10/3/41		C. A. S.	No wind

C. C. —Clarence Cottam
C. S. W.—Cecil S. Williams
C. A. S.—Clarence A. Sooter
R. G. —Richard Griffith

TABLE 2

RUNNING SPEED OF BIRDS

Species	Miles per hour	Place	Date	Distance covered	Observer	Remarks
Sage Hen	2	Near Alturas, California	7/2/41	30 ft.	C. C. C. S. W.	In road, immediately front of car
European Partridge	9	Malheur Refuge, Oregon	6/29/41	30 yds.	C. C. C. S. W. C. A. S.	On dike road, in front of car
Chukar Partridge (*Alectoris graeca*)	12	Lower Souris, North Dakota	8/2/41	20 yds.	C. C. R. G.	In front of car
Chukar Partridge	18	Missouri	June 1939		H. D.	Field report of Missouri Cooperative Unit
Gambel's Quail	11	Kofa Refuge, Arizona	7/10/41	30 yds.	C. C.	In road in front of car, covey of 14, not quite grown
Gambel's Quail	14	Kofa Refuge, Arizona	7/10/41	20 yds.	C. C.	Female adults, in road in front of car; pressed
Ring-necked Pheasant	8–10	Malheur Refuge, Oregon	6/28/41	200 yds.	C. C. C. S. W. C. A. S.	Two males, in weedy road on dike between ponds; pressed
Ring-necked Pheasant	10	Lake Bowdoin Refuge, Montana	7/25/41	100 yds.	C. C. R. G.	In soft dirt road; pressed but speed obviously impeded
Ring-necked Pheasant	10, 12, 15, 21	Lower Souris, North Dakota	8/2/41	50 to 100 yds.	C. C. R. G.	Single birds; in road in front of car; pressed
Ring-necked Pheasant	12	Bear River Bird Refuge, Utah			E. R. Q.	Immature, 2/3 grown

Ring-necked Pheasant	8–12	Camas Refuge, Idaho	9/16/41	30 yds.	C. C. C. S. W.	Immature, 2/3 grown; in front of car
Killdeer	5	Las Vegas, Nevada	7/4/41	30 ft.	C. C.	On dike between two ponds; in front of car
Long-billed Curlew	8	Bear River Bird Refuge, Utah	6/26/41	30 ft.	C. C. C. S. W.	Immature, bird of the year; in front of car
Long-billed Curlew	8–10	Bear River Bird Refuge, Utah	6/29/41	75 yds.	C. C. C. S. W.	Adult, on dike between two lake units; in front of car, pressed
Avocet	8	Bear River Bird Refuge, Utah	6/29/41	50 ft.	C. C. C. S. W.	Adult, on dike between two lake units; in front of car, pressed
Road-runner	12	20 miles south of Phoenix, Arizona	7/11/41	50 yds.	C. C. J. A. N.	In very deep soft silt in road in front of car; pressed
Road-runner	15	Near St. George, Utah	9/5/26	300 yds.	C. C.	Up 3 per cent grade, dirt road; pressed

C. C. —Clarence Cottam
C. S. W.—Cecil S. Williams
C. A. S. —Clarence A. Sooter
R. G. —Richard Griffith
H. D. —Hugh Denney
E. R. Q.—Erling R. Quortrup
J. A. N.—Johnson A. Neff

U. S. Fish and Wildlife Service, Washington, D. C.

NOTES ON THE MIGRATIONS OF THE ELF AND FLAMMULATED SCREECH OWLS

BY ALLAN R. PHILLIPS

WHILE gathering information on the birds of Arizona, I found in 1937 that winter records for certain owls were few or lacking. When this was mentioned to Mr. E. C. Jacot, who is thoroughly familiar with Arizona night birds, he expressed the opinion that two of these owls did not winter within the state. Further inquiry establishes at least a high degree of probability that Jacot's views are correct. These two very migratory owls are discussed below.

In addition to the literature, I have drawn upon information from the following sources: U. S. Fish and Wildlife Service, U. S. National Museum, Field Museum of Natural History, American Museum of Natural History, and the private collection of Dr. L. C. Sanford, University of Utah, University of Arizona, and Arizona State Museum. Mr. J. Frank Cassel kindly supplied data on specimens in the Academy of Natural Sciences of Philadelphia, and Mr. J. Southgate Y. Hoyt on those in the Museum of Comparative Zoology at Harvard College. I wish to express my appreciation to these gentlemen and to the authorities of these institutions.

Elf Owl (*Micropallas whitneyi*)

Though repeatedly sought, this owl has never been authentically recorded in winter in southern Arizona; it is probably the most numerous of all owls there in summer. A. B. Howell (1916: 211) long ago questioned its wintering there, yet most ornithologists continue to think of it as a resident species.

Three races are currently recognized. Since these do not seem to have the same migratory behavior, it is advisable to consider each separately. *Micropallas whitneyi sanfordi* of Baja California appears to be resident, though further data are desirable. It does not seem to be an especially rare bird.

M. w. idoneus of extreme southern Texas is a rare bird whose status requires further elucidation. As far as I know, the earliest spring record is March 14, 1894, at Brownsville (specimen in Philadelphia Academy of Natural Sciences, fide J. F. Cassel). This date agrees well with the arrival of Elf Owls in southern Arizona and therefore provides no evidence that the species winters in Texas.

The great bulk of our knowledge of the species has been obtained in central southern Arizona, with whose saguaro (giant cactus) country we have long associated it. However, it is by no means restricted to that association. Jacot has found it common in the Huachuca Mountains in the oak belt, and various others have reported it in the same association

in other mountains. In fact, from the live oak belt downward, it apparently breeds wherever there are suitable nesting holes in central southern Arizona.

In this area of abundance, numbers of Elf Owls have been taken from late March to June, and others in the summer months and as late as the first week of October. The latest record seems to be Oct. 10, 1885, at Tucson (one ♀ in Arizona State Museum, taken by Herbert Brown).

Spring return seems to occur usually in early March. The earliest date is February 25, 1940, when I took near Tucson a male which was prepared by Lyndon L. Hargrave and is now in my collection. Probably they arrive regularly the last of February or first of March, although the next certain record seems to be March 12, 1908, at Campbell's Ranch on the Rillito (reported by H. H. Kimball to Fish and Wildlife Service). On both March 16 and 17, 1938, I noted several near Tucson, and three specimens were secured in an hour's collecting on March 16; in view of the number seen, I believe that they had probably arrived some days previously.

The available data, then, show clearly that the southern Arizona Elf Owls migrate to an unknown winter home in early October and return in early March. The male (Fish and Wildlife Service collection) taken by E. W. Nelson at Tehuacan, Puebla, May 4, 1893, furnishes some evidence that the species breeds at least that far south; otherwise the males would probably have migrated north long before that date. I have seen no other dated specimens from southern or central Mexico. Whether the species migrates south out of its breeding range or merely withdraws into the southern part of it awaits discovery.

Flammulated Screech Owl (*Otus flammeolus*)

Swarth (1904: 9) long ago stated that this owl was "quite a common migrant" in late April and early May in the Huachuca Mountains, Arizona. Jacot (1931: 10) failed to find it in winter in those mountains. Swarth also (1914: 30) regarded it as a "summer visitant" only, in Arizona. Nevertheless, current literature still treats this owl as a resident, non-migratory bird. This treatment is not justified by the facts. As far as I can ascertain, all but one of the definitely dated records for the United States and Canada fall between April 11 and October 31. Dates of interest, arranged by states and provinces, are as follows:

British Columbia.—The "dilapidated specimen" picked up in November, 1902, at Penticton (Brooks, 1909: 61) hardly constitutes a satisfactory date of occurrence.

Oregon.—Extreme dates are April 30, 1939, at the Malheur Refuge to October 15, 1940, in the Steens Mountains (both dates reported to the Fish and Wildlife Service by Refuge Manager J. C. Scharff).

California.—The male reported (Stephens, 1902) as taken north-

east of San Bernardino, January 18, 1885, by Forest Ball, I regard as probably casual. Mr. Hoyt kindly checked the original label on the specimen at Cambridge and found that it confirmed the date. The latest date otherwise is October 31, 1935, at Davis (Emlen, 1936).

IDAHO.—The latest date is Sept. 28, 1914, near Coeur d'Alene (Rust, 1915: 125), but it probably stays later. The supposed egg with "incubation well begun" (Short, 1904) taken April 25, 1901, near Meridian was very doubtfully identified; it is questionable whether the birds even *reach* Idaho before April 25.

UTAH.—The latest date is October 26, 1934, at Salt Lake City (Woodbury, 1939: 158).

COLORADO.—The latest date is October 4, 1894, at Breckenridge (Cooke, 1900: 206), but it doubtless stays later. The supposed "March" record (Ridgway, 1877: 210), based on a skin in the Maxwell collection, I consider unsatisfactory since the data given by Ridgway on this collection have sometimes proved erroneous.

TEXAS.—Earliest of the few records is April 19, 1890, in Presidio County (Oberholser, 1899). Date secured from the specimen in the Fish and Wildlife Service collection.

NEW MEXICO.—Recorded from April 11 and 15, 1887, at Mimbres (skins in Field Museum) to October 19, 1909, in the Mogollon Mountains (Bergtold, 1912: 332).

ARIZONA.—April 13, 1935 (vague statement by Jenks and Stevenson, 1937: 88), or April 14, 1930, in the Huachuca Mountains (Jacot, 1931: 11) is the earliest valid date.

It thus appears that the Flammulated Screech Owl arrives in the western United States generally in middle or late April and remains until late in October. What, then, is its status in Mexico? Here we lack detailed data. The species evidently winters north at least to Mount Orizaba and breeds south to Las Vigas, Veracruz, but the great majority of records lack exact dates.

The discovery of the extent of the migrations of this owl suggests the need for a review of its taxonomy and nomenclature. Kaup's original diagnosis is too brief to indicate the coloration of his specimen or specimens, but six years later (1859: 226) he described the species more adequately. Two specimens are mentioned but the first is described at greater length and must be considered the type. This was a gray bird and the name *flammeolus* is therefore correctly applied to a northern race. I suspect that all these gray individuals from southern Mexico and Guatemala (Ridgway, 1914: 730, footnote) are migrants. Kaup thought that his second bird was young, and his brief remarks that it was smaller and that the "rufous color predominates" indicate that it probably represented the local breeding race.

I know of no published evidence that this species breeds in Guatemala. The two dates seen are both in January. While I fully believe

that Griscom's *rarus* is a valid race, it is possible that it may breed only in southern Mexico. Moore and Peters (1939: 56) state that a specimen from the Valley of Mexico "resembles *rarus* closely, but shows a greater extension of cinnamon markings above and below." This hardly seems likely to prove constant when adequate series become available.

In this connection I have compared three especially critical specimens: a red male (Field Museum No. 19751) from Tecpam, Guatemala, January 7, 1906 (Dearborn, 1907: 84), believed to represent *rarus;* the breeding female (No. 7204, Louis Agassiz Fuertes Memorial Coll. of Cornell Univ.) from Las Vigas, Veracruz, April 4, 1939 (Sutton and Burleigh, 1940: 238); and a female (L. C. Sanford collection, No. 15768) taken by Jacot in the Huachuca Mountains, Arizona, June 5, 1922, which is the reddest United States specimen that I have seen. The Guatemalan bird, unfortunately, may not have reached fully adult plumage. In any case, it differs from the other two much as stated by Ridgway (1914: 729–730). It has an unstreaked pileum; warm brown sides of neck, back, rump, and tail; pale cinnamon tarsal feathers, cheeks, and upper sides; reduced and paler dark streaks and bars in underparts and in rear of auriculars; and less white in the head, the anterior white nuchal band being almost gone.

The Veracruz bird resembles northern birds in its heavy, dark crown-streaking and breast-penciling, but is in most respects intermediate. It is darker than the Arizona bird, probably only by individual variation. The anterior nuchal band is narrow but distinct. The tarsal feathering is cinnamomeous only proximally. This and the Arizona bird are quite similar dorsally.

The Sanford collection contains an excellent series from the inland southwest. These are mostly from the Huachuca Mountains, Arizona (April and May) and from Reserve, New Mexico (June, July, and September). The southern Arizona series is distinctly different from the more northern New Mexican birds, which are less rufescent, especially on the crown and the scapular spots.

A quite rufescent bird in the Sanford collection, taken by G. F. Breninger and without an exact date or original label, is marked as having been taken at Fresno, California. It agrees well with birds from the Huachuca Mountains, however, and I suspect that that is where it was really taken, as Breninger did considerable collecting there.

It is obvious that, in such a migratory and variable species, the material at present available is insufficient to settle the taxonomic and nomenclatural problems presented. The data at hand indicate that:

(1) The grayest birds are found in the western United States generally, south probably to central Arizona and central New Mexico. If the name *flammeolus* applies to the north Mexican race, these would become *O. f. idahoensis* (Merriam).

(2) Birds breeding from southern Arizona south are slightly redder.

The name *flammeolus* may or may not apply to these birds. Birds of the Sierra Madre Occidental may resemble either southern Arizona or southern Mexican birds, or may fall between the two.

(3) Birds breeding in southern Mexico are still redder, and may or may not be separable from *rarus*. Whether the latter breeds at all in Guatemala remains doubtful.

In connection with the migrations of the Flammulated Screech Owl it is interesting to note that Delacour (1941: 133–134) considers the races of this bird to be subspecies of the Old World *Otus scops*, whose northern forms are known to be migratory.

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CORNELL UNIVERSITY, ITHACA, NEW YORK

THE WILSON ORNITHOLOGICAL CLUB ENDOWMENT FUND

The Wilson Ornithological Club feels the need of adding considerably to its present modest endowment. Such additional funds will increase the financial stability of the Club and will provide extra income which will enable us to enlarge the *Bulletin* and add to its attractiveness, thus insuring the maintenance of our standard of publication and keeping the *Bulletin* in the forefront of ornithological journals. The task of securing such funds has been assigned to the following committee:

Bernard W. Baker
Harold D. Mitchell
Olin Sewall Pettingill, Jr.
James B. Young
George B. Thorp, Chairman

The publication and distribution of the *Bulletin* is our most important contribution to ornithology, and absorbs the greater part of our income, which is at present almost entirely from dues. The committee plans to build up the Endowment Fund so that the extra income therefrom will enable us to attain the ends mentioned above. More illustrations, an occasional color plate, and more pages of text will greatly increase the appeal of the *Bulletin*. In turn, new members will be attracted, the subscription list will increase, and a healthy growth of both journal and club will result.

Such increase in endowment can come only from members of the Club and its friends. The committee believes that subscribing to a Life Membership constitutes the most satisfactory way for a member to assist in building up the fund. All money received from Life Memberships is automatically placed in the Endowment Fund. A Life Membership ($100) may be paid for in four annual instalments or in a lump sum, with credit for 1942 dues already paid. Though the Club's membership list totals about 1,100, there are but 10 Life Members, none having been added since 1929. We should have many times this number. Several members have already indicated their intention of backing the committee's efforts.

The committee will shortly make a direct personal appeal to all the members of the Club. But if you are already convinced of the value of the Club's contribution to ornithology and sound conservation, and are desirous of promoting cooperation and good fellowship among bird students, will you not anticipate the committee's direct appeal and send in your pledge to take out a Life Membership now or in the near future?

ENDOWMENT COMMITTEE

GENERAL NOTES

Avian Psychological Disturbance Resulting from Abnormal Coloration.—As a note supplementary to the discussion of this subject by Frances Hamerstrom in the issue of this journal for March, 1942 (*Wilson Bulletin*, 54: 33), it may be remarked that the psychological disturbance occasioned in certain flocks of birds by abnormal coloration of one of their number is recorded as having been noticed at least 2,550 years ago. In the Book of Jeremiah, chapter XII, verse 9, to which the date 608 B.C. is commonly attributed, the prophet states:

"Mine heritage is unto me as a speckled bird, the birds round about are against her."

The specific identity of the birds on which this remark is based is not indicated; it is not even known whether they were passerine birds. It is improbable that they were domestic fowls, for this prophecy preceded the carrying away of the Jews into Babylonian captivity (586 B.C.), while domestic fowls are not believed to have been introduced into Palestine until after the return from captivity, more than seventy years after the prophecy was made.—Harrison F. Lewis, *34 Grosvenor Avenue, Ottawa, Ontario.*

American Bittern Wintering in Michigan.—In the midst of a marsh near the town of Erie in the southeastern corner of Michigan there is a large spring of mineral water which keeps a pool unfrozen throughout the coldest winter. Here in mid-winter have been seen a number of birds that are uncommon in this season elsewhere in the region.

On March 1, 1942, John Stophlet and I found there an American Bittern (*Botaurus lentiginosus*) huddled, frozen, in a small depression. The body was emaciated. Apparently the bird had died since a snowfall of six days before. Louis W. Campbell has sight records of this species in the same location January 18, 1930, and February 18, 1933.—Harold F. Mayfield, *3311 Parkwood Avenue, Toledo, Ohio.*

Some New Water Bird Records for Kentucky.—Satisfactory records of water birds, notably Charadriiformes, in Kentucky are exceedingly few because of the limited amount of material that has been collected. Consequently we wish to record a heron, two shorebirds and a tern collected during 1941.

Yellow-crowned Night Heron (*Nyctanassa violacea violacea*).—A beautiful male of this species was taken by Mengel on June 29, 1941 at the extreme northern end of Reelfoot Lake in Fulton County, Kentucky. This bird appears to be the first preserved specimen for the state. L. O. Pindar (*Wilson Bulletin*, 37, 1925: 81–82) mentions a Yellow-crowned Night Heron "seen" dead in Fulton County, September 1, 1887. These herons were regularly present in small numbers at the north end of Reelfoot Lake during late June, 1941. The bird collected was fully adult but the gonads appeared somewhat reduced.

American Knot (*Calidris canutus rufus*).—In company with Mary Louise Fagley, Elizabeth Grawemeyer, and J. Frank Cassel, all of Cornell University, Mengel visited the Falls of the Ohio River near Louisville, Kentucky on August 28, 1941. Cassel promptly noticed a strange shorebird among the "peeps." It was collected and proved to be a male Knot in full fall plumage. So far as we know it represents the first occurrence of the species in Kentucky.

Baird's Sandpiper, *Pisobia bairdi*.—Monroe secured a specimen of this sandpiper on September 1, 1941 at the lower end of the Falls of the Ohio. There are several previous sight records for the Louisville area, (Monroe and Mengel, *Kentucky*

Warbler, 15 1939: 43) and some for Warren County (Gordon Wilson, *Kentucky Warbler,* 16, 1940: 19) but this specimen seems to be the first for the state.

Caspian Tern (*Hydroprogne caspia imperator*).—Caspian Terns have been seen in the Louisville area in early fall for a number of years. (Monroe, *Auk,* 55: 678, 1938). The first specimen, however, was not secured until September 6, 1941 when Monroe killed one of several birds which had been about the Falls of the Ohio for some days. So far as we know, this is the first actual specimen for Kentucky.

All specimens mentioned are in the authors' collection at Anchorage, Kentucky.—BURT L. MONROE, *Louisville, Kentucky,* and ROBERT M. MENGEL, *Cornell University, Ithaca, New York.*

Ducks following Bald Eagles.—Upon two occasions I in company with others witnessed ducks following or chasing Bald Eagles (*Haliaeetus leucocephalus*). On April 25, 1926, Charles F. Walker and I noted an eagle flying over the Huron Marsh, Huron County, Ohio. As the eagle flew over a flock of about 500 Pintails (*Anas acuta*) that were sitting on a pool in the marsh, the ducks arose and began to follow. The leaders of the flock quickly gained a position some 20 to 50 feet behind the eagle, with the remaining ducks following their leaders in a long, sinuous flock. This flock followed the same route as did the eagle, and we observed no attempt by ducks in the latter part of the flock to "cut corners". As the eagle continued to circle and rise, the long, following flock did likewise, assuming some form of a hollow oval, circle, or "figure 8." Ducks approaching the eagle at lower elevations paid no apparent attention to it, but continued following their immediate leaders. Once the flock was formed, each duck closely maintained its relative position, and we noted no attempt of individuals to forge ahead, or of the leaders to attack the eagle. After a few minutes the eagle had gained several hundred feet in altitude, whereupon it dove downward at a moderate angle and with greatly accelerated speed, thus leaving behind its more slowly flying pursuers. When the ducks found themselves outdistanced they returned to the pool whence they came. At no time did the eagle attempt to molest the ducks. The flock was composed mostly of males, as April flocks of Pintails often are.

On February 6, 1942, my wife and I observed a similar performance. While watching an eagle flying over a flooded cornfield, in Monroe County, Michigan (about nine miles north of Sylvania, Ohio), we saw about 500 ducks arise from the field and begin to pursue the eagle. The eagle circled as described above, the ducks followed the eagle in the same flock formation and manner, the eagle outdistanced its pursuers by diving at a moderate angle after gaining altitude, and the ducks resettled in the cornfield. The latter flock was composed mostly of Black Ducks (*Anas rubripes*), together with a few Mallards (*A. platyrhynchos*). Both eagles were white-headed and white-tailed.

In both instances flock unity or solidarity of the ducks was outstanding. Apparently their behavior was analogous with the more frequently seen phenomenon of a dense, globular flock of Starlings flying above or behind a hawk. No attempt was made to strike the pursued, as Crows do.—MILTON B. TRAUTMAN, *Stone Laboratory, Put-in-Bay, Ohio.*

Glaucous Gull in Oklahoma.—The Glaucous Gull (*Larus hyperboreus*) is primarily a bird of the Arctic or Sub-Arctic regions and rarely winters further south than northern California and New York. Relatively few even reach the Great Lakes. The species has apparently not been reported from Oklahoma.

On March 1, 1942, the authors, with Game Management Agents L. W. Merovka and Milton H. Boone, were met by Ranger Alfred Wensel of the Oklahoma State Game and Fish Commission, and by courtesy of the Commission were furnished a boat with which to inspect the wildlife resources of the recently impounded Grand River Reservoir in northeastern Oklahoma.

Near the state highway crossing the Reservoir west of Grove we observed two Glaucous Gulls along with some Ring-billed and a few Herring Gulls. The two northern gulls circled over our boat and came within 40 feet of us. Their very large size and completely white color made identification a simple matter. Because of their extreme white color and dark-tipped beak, it appeared that they were sub-adult, probably two-year-old birds. We watched them for about a half hour during the early forenoon and later the same day we saw one bird of the same species some 10 miles up stream from where the first pair were noted. Still later in the day we found another about 5 miles below the highway bridge. We suspect that the latter two birds were the same individuals seen earlier in the morning.—SETH H. LOW, RICHARD E. GRIFFITH, and CLARENCE COTTAM, *U. S. Fish and Wildlife Service.*

Works of North American Ornithologists.—An abstract of a paper presented at the twenty-seventh annual meeting of the Wilson Ornithological Club states, "there has been no simple published account of the works of the men who have influenced North American Ornithology" (*Wilson Bulletin*, 54, March, 1942: 69).

What the word "simple" implies in this connection is problematical. If it were omitted, the statement would be recognized as unfounded. At the risk, in this period of youth movement, of seeming too devoted to records of the past, I would point out that aside from being treated in biographies by the hundreds, the works of men who have influenced North American ornithology have been by no means neglected by competent reviewers.

The author of the paper mentioned appears to be acquainted with the resume by Coues, but that is only one of several recapitulations. Witness:

ALLEN, J. A.
1876 Progress of ornithology in the United States during the last century. *Amer. Nat.*, 10: 536–550.

CHAPMAN, F. M., and T. S. PALMER, Editors
1933 Fifty years' progress of American Ornithology 1883–1933. American Ornithologists' Union, Lancaster, Pa. (249 pp., frontispiece).
Chapters on 14 divisions of the subject by as many authors, together with introductory and concluding matter relative to the A.O.U. by the Editors.

COUES, ELLIOTT
1927 Key to North American birds, etc. 5th edition, 2 vols. Boston.
Historical preface. Vol. 1, pp. xi-xxvi.

FOWLER, S. P.
1862 Ornithology of the United States, its past and present history. *Proc. Essex Institute*, 2: 327–334.

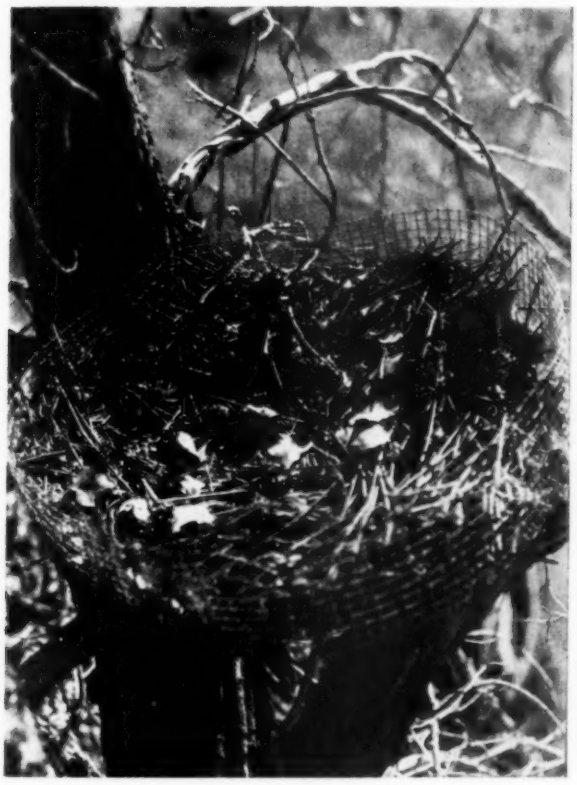
PALMER, T. S.
1900 A review of economic ornithology in the United States. *Yearbook U. S. Dept. of Agriculture*, 1899: 259–292, pls. 6–8, 3 figs., tables.

STONE, WITMER
1899 Some Philadelphia ornithological collections and collectors, 1784–1850. *Auk*, 16: 166–177.
"During the first half of the present century Philadelphia stood pre-eminent in the American ornithological world. The large majority of our early ornithologists were Philadelphians, either by birth or residence."

The importance of bibliographical research can scarcely be over-estimated. A scientist should be wedded to the literature of his subject and as said of the ordinary marital relation, it will doubtless often prove that the partner is the better half.—W. L. MCATEE, *Wildlife Service, Washington, D.C.*

An Unusual Nest of the Great Horned Owl.—A pair of Great Horned Owls (*Bubo virginianus*) was found nesting in an abandoned Crow's nest in a low cottonwood tree on the Valentine National Wildlife Refuge, Nebraska, in the spring of 1936. This nest was used by Great Horned Owls each spring during 1937, 1938, and 1939. It was almost completely worn out by the time the young owls left the nest in 1939. In fact, the two young were forced to rely for a perch, to a great extent, on the branches which supported the nest.

An artificial nest was substituted on the remains of the old nest in March 1940. This was constructed of ⅜ inch hardware cloth. It was circular, 18 inches in diameter with sides 5 inches high, as illustrated in the accompanying photograph.



Nesting material from an abandoned Crow's nest was placed inside the screen retainer. The nest was not used that spring. It is possible that another had been selected prior to the time the artificial one was substituted, but we were unable to discover any in the vicinity.

The man-made nest was used in 1941, and two eggs were laid during March. Two young owls were hatched and reared in this nest.—Ward M. Sharp, *Fish and Wildlife Service, Valentine National Wildlife Refuge, Valentine, Nebraska.*

Winter Records of the Mourning Dove and Band-tailed Pigeon in Washington.—The Western Mourning Dove (*Zenaidura macroura marginella*) has seemingly not been recorded as occurring in winter in the state of Washington, although Gabrielson and Jewett ("Birds of Oregon," 1940: 328) give several winter records for points in Oregon near the Washington line, and Bent (*U. S. Nat. Mus. Bull.*, 162, 1932: 413) lists casual winter records for Emmet and Gray, Idaho, and Okanagan Landing, British Columbia. Recently (*Murrelet*, 22, 1941: 60) I summarized the available records of the species in the western part of the state, listing April 7 and October 29 or 30 as extreme dates of arrival and departure. The occurrences described below are considered, therefore, as representing a first winter record for the state and a new early date for spring arrivals.

On January 13, 1942, while visiting the State Game Farm at Auburn, King County, Washington, I observed a single Mourning Dove. When first seen the bird was perched on a wire fence at the edge of a road near the farm buildings and was quite tame, allowing an excellent study with binoculars at distances of only 10 to 30 feet before it flew off. A few minutes later William Morrell and W. W. Wadkins of the farm volunteered the information that they too had noticed this bird, declaring it to be the first seen there for over two months and the first winter occurrence in their experience. On February 2, I again talked with them and learned that the bird had remained only "a day or two" before disappearing.

During a subsequent visit (March 20) Wadkins and Morrell stated that the single winter bird apparently never returned, but they reported that in the first week of March, about March 4, they saw six Mourning Doves on a telephone wire at the farm. This seems an unusually early date for spring arrival. Again, on March 30, Wadkins stated that perhaps five *pairs* were seen repeatedly about the farm from March 18 to 22. It so happened that on none of my visits after January 13 did I personally encounter the birds.

The occurrence of this "summer resident" following one of the coldest spells of December-January weather in recent years seems doubly unusual. It may be noted, however, that on December 29, during the height of the cold snap, I also recorded my first winter observation of Band-tailed Pigeons (*Columba f. fasciata*) in this state; on that date 26 were observed at close range in a Douglas fir top in Buckley Gulch at Tacoma. Subsequent identifications in the same area have been as follows: February 28 (10 birds, Jane M. Slipp), March 1 (10 birds), March 2 (25 birds), and March 7 (40 birds). In previous years my observations in this portion of the Puget Sound trough have yielded dates extending from March 27 to October 28, with main migratory flights apparently in April and September.—JOHN W. SLIPP, *University of Washington, Seattle.*

Bonaparte's Type of Passerculus anthinus.—A fair number of Bonaparte's and most of Du Bus' types are at the Musée Royal d'Histoire Naturelle de Belgique in Brussels, an institution which for some reason seems to have escaped visits by ornithologists interested in the systematics of American birds. Among the Bonaparte types is that of *Passerculus anthinus*, the racial identity of which has always been uncertain although guessed at with varying degrees of success. It is with considerable satisfaction, therefore, that I am able to record that the name accords with the diagnosis of Peters and Griscom in their recent review of the Savannah Sparrows(*Bull. Mus. Comp. Zool.*, 80, 1938, pp. 445–478) wherein they applied it properly to the slender-billed, grayish-brown race of the Alaska mainland in general, south to northern British Columbia. Whether or not the name *anthinus* applies to the breeding birds of Kodiak Island, the purported type locality, is another question and one concerning which I am certainly not going to express an opinion at this time.

Notes concerning the type, which was examined at Brussels in July, 1939, are herewith summarized. The bird is mounted on a conventional bar perch and in a fair state of preservation save for pronounced fade on the right side. The concealed portions of the plumage appear to be quite normal for the race at the age and season when collected, but the precise degree of fade is relatively unimportant in view of the characteristic bill and other measurements. The plumage is fresh post-juvenal with a few juvenal feathers evident among the upper and under tail coverts. There is no indication of sex other than that measurements suggest a male. They are as follows: wing, 71; tail, 52; exposed culmen, 9.7; depth from malar apex to base of culmen, 5.0; tarsus, 19.9; middle toe minus claw, 14.5 mm. There is no indication of typeship on the label except the locality "Kadiak" and the reference number 178. This the catalogue lists as "type du l'anthinus Bp.", with the notation that it came from the Du Bus collection. It is of interest to observe that a former specimen in the Museum collection proper is catalogued (789) as the "type du parvirostris Bp." with the notation that it had been destroyed and a further remark (translation) "this name probably unpublished. It was so written on the old stand by Bonaparte himself."

As to the type locality of *Passerculus anthinus*, I see no reason to doubt the one given, that is to say Kodiak Island, where the bird may well have been taken in migration.—A. J. VAN ROSSEM, *Department of Zoology, University of California, Los Angeles.*

WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been received recently:

Ralph Beebe—22 pamphlets and magazines
T. Hume Bissonette—3 reprints
Oscar M. Bryens—1 reprint
A. Sidney Hyde—30 magazines
Leon Kelso—1 pamphlet
Karl F. Lagler—7 pamphlets
Earl L. Loyster—1 pamphlet
Dayton Stoner—1 bulletin

EDITORIAL

Elsewhere in this issue is printed the appeal of the Club's Endowment Committee for more Life Memberships as a means of providing a much-needed increase in our endowment fund. To members who feel that they cannot take out Life Memberships just now, we would point out that any gift, however small, will be gratefully added to the endowment fund. One such gift has already been received and we hope it will be followed by many more. Won't you write to our Treasurer now and send a contribution?

This is the time of year when our members are most busy gathering the data that will fill some of the gaps in our knowledge of the breeding habits of birds. Sometimes in the past these efforts have, for lack of guidance, been partly wasted on poorly planned or inadequately recorded observations. Excellent suggestions on exactly what to look for and how best to record it have been published recently by Odum (*Oriole*, 6, 1941: 29–35) and Pitelka (*Auk*, 58, 1941: 608–612). It is really remarkable how incomplete are the files of such data for even the most common species of birds.

OBITUARY

Vernon Bailey, mammalogist and ornithologist, died in Washington, D.C., on April 20. He was one of the most skillful and experienced of field zoologists and had done pioneer work in many parts of America.

Benjamin T. Gault died at his home in Glen Ellyn, Illinois, on March 20 at the age of 83. He was perhaps most widely known for the section on the birds of Glen Ellyn which he contributed to Frank M. Chapman's great "Handbook." He had been a member of the Wilson Ornithological Club for 47 years.

C. Hart Merriam, founder and for twenty-five years Chief of the U.S. Bureau of Biological Survey, died on March 20 at the age of 86. He was a founder of the American Ornithologists' Union and later was elected its President. His "Life Zone" theory of plant and animal distribution greatly stimulated and guided bird distribution study in this country.

Edward R. Warren, noted Colorado naturalist, died on April 20. He had contributed extensively to our published information on mammals and birds, especially of Colorado.

Casey A. Wood, distinguished bibliographer and authority on the eyes of birds, died in La Jolla, California, on January 26.

ORNITHOLOGICAL NEWS

John T. Zimmer of the American Museum of Natural History has been appointed Editor of *The Auk*. The fourth to hold this distinguished office, he takes over the editing of volume 59 of the official organ of the American Ornithologists' Union.

Austin L. Rand has been appointed Assistant Zoologist of the National Museum of Canada in Ottawa. He will take charge of ornithology there upon the retirement this month of Percy A. Taverner.

F. L. Jaques spent part of April in Minneapolis, collecting materials and painting a background for a new habitat group of Blue and Snow Geese in the University of Minnesota Museum of Natural History.

WILDLIFE CONSERVATION

Conservation Note from Canada

There has been in recent years a notable increase in the numbers of Ring-billed Gulls and Caspian Terns nesting on islands in and near the east end of Lake Ontario. In 1941 at least five breeding colonies of Ring-billed Gulls were reported in that vicinity, four of them on islands in Lake Ontario and one on an island of the Thousand Islands group, in the upper St. Lawrence River. The largest of these colonies is reliably reported to have contained 3,200 nesting Ring-bills. In the same year observers reported two breeding colonies of Caspian Terns, the larger of which contained 100 nesting individuals, as being intimately associated with two of the Ring-billed Gull colonies.

All the colonies here referred to are in the province of Ontario, Canada, although one of them is within a mile of New York State and none, of course, is far from it. It seems very likely that similar colonies of one or both species exist on the New York side of the boundary.

Increase in the population of Ring-billed Gulls and Caspian Terns of Lake Ontario is attributed largely to continued protection of these species in both Canada and the United States in accordance with the terms of The Migratory Birds Treaty. —Harrison F. Lewis.

The Status of the White-winged Dove in Texas

The Eastern White-winged Dove (*Melopelia asiatica asiatica*), an important game bird in the southern tip of Texas, has decreased greatly in abundance during recent years as the Rio Grande delta has been more and more intensively cleared and farmed. The Texas Game, Fish and Oyster Commission has reported that as recently as the autumn of 1924 there were in the lower Rio Grande valley of Texas at least twenty major "flights" of these doves, the estimated population of which totalled four million or more individuals. During the autumn of 1941, State and Federal investigators estimated that fewer than 300,000 "white-wings" were present in the same area.

A joint Federal-State investigation of the status of this dove is now in progress, the principal objectives of which are to determine what can be and should be done to safeguard the future of White-winged Doves in Texas. The two cooperating agencies are the Division of Wildlife Restoration (Pittman-Robertson Division) of the Texas Game, Fish and Oyster Commission and the Fish and Wildlife Service. The investigation is to be completed this year (1942), and subsequently a report of findings and recommendations will be published.

The breeding range of the Eastern White-winged Dove on the mainland extends from Nicaragua northward through eastern Mexico to southeastern Texas. That part of Texas is also the northernmost limit of the types of woodland which this dove prefers for nesting habitat. For this and other reasons no large populations of breeding White-winged Doves are to be found north of the Rio Grande delta.

The doves arrive in April and May, nest from May into August, and leave for wintering grounds in southern Mexico and Central America, especially in El Salvador, from August until late October. During 1940 and 1941 more than four thousand nestling White-winged Doves were banded in Texas. Of these there have been many returns during the hunting season from within a radius of less than one hundred miles. Seven of these banded birds have been reported from a much greater distance; of these, five were taken in El Salvador, one in Guatemala, and one in Mexico approximately 100 miles south of Tampico.

Sufficient research has already been completed to indicate that the three principal limiting factors are (1) the great reduction in acreage of nesting grounds due to the clearing of woodland to provide agricultural land, (2) the reduced production of young due to loss of eggs and young to predators, and (3) the heavy kill during the hunting season.

The present status of the subspecies is not one to cause optimism. Both the acreage of nesting grounds and the production are factors difficult to control. Approximately 500,000 acres of potential nesting cover in Texas have been destroyed during the last twenty years. The high cost of land makes the acquisition of refuge expensive. Eggs and small young eaten by Great-tailed Grackles and Green Jays comprise the bulk of predation, according to studies made during the past two summers. In several small colonies more than 90 per cent of the eggs laid by White-winged Doves were eaten by predators. Records of one major colony show that 5.7 eggs were laid for each fledged young produced during the nesting season. Present information is that most pairs attempt to raise two broods, two young per brood, but because of losses through predation they average slightly less than two fledglings raised to flying age during the summer. Preliminary investigation has not been sufficient to indicate a practicable method for control of predators.

Hunting pressure, however, can be regulated. In 1941, for example, the open season in the lower Rio Grande Valley was limited by drastic changes in State and Federal regulations to five half-days (September 16, 18, 21, 23 and 25, afternoons only). This was a radical change from the 1940 season which provided for shooting on four days a week (Tuesday, Thursday, Saturday and Sunday) between September 15 and November 15, for a total of 35 shooting days.

In the Rio Grande delta the majority of the White-winged Doves nest in colonies ranging in size from a few pairs to a few thousand pairs. The largest known colony had more than 15,000 pairs in 1940 and 1941, with a population density of more than 250 pairs per acre in parts of the woodland. No other colonies have been found in Texas which even approach it in size.

All of the important colonies known are located in dense woodland near former channels of the Rio Grande. The Texas ebony (*Pithecollobium flexicaule*) is almost invariably present either as a dominant or common species and is a favorite nest tree. Granjeno (*Celtis pallida*) associated with mesquite (*Prosopis glandulosa*) form another favored nesting habitat. The soil types represented are among the best in the delta, consequently most of these woodlands have already been cleared to provide agricultural land. The small acreage of such woodland remaining limits the available first-class nesting grounds. As yet it is not known whether the amazing density of breeding pairs in some of these colonies is an ancestral habit or whether the shrinkage in area of preferred nesting grounds in recent years has concentrated greatly the principal colonies. In northeastern Mexico where the subspecies has also been studied by the Fish and Wildlife Service no such densities of breeding White-winged Doves have been found, except in delta woodland near the Rio Grande.

The principal objectives of the conservation agencies cooperating in this investigation are to learn how a further decrease of White-winged Doves can be prevented, and how, if possible, the population can be increased. The acquisition of the several largest nesting areas, constituting less than 1,000 acres, would be a most timely move to prevent further depletion of the Texas population. Some management of these permanent refuges may be found practicable.

A closed season on White-winged Doves in Texas has been suggested by some conservationists; however, if the primary causes of decrease are directly and indirectly due to continued reduction in area of nesting grounds, a closed season would not solve the problem.

The recommended acquisition of the most important remaining nesting grounds of the Eastern White-winged Dove in Texas involves more than consideration of this one decreasing subspecies. It envisions the preservation of representative areas of delta woodland together with their rapidly disappearing biota. Unless these units are acquired for permanent protection as State or Federal refuges, it seems likely that they, too, will be cleared in the not far distant future.—E. G. Marsh, Jr. and George B. Saunders.

Ohio Fish Hatcheries

During the past decade conservation in America has made rapid and satisfactory progress. At present this progress is partially slowed down because of the war, and in some fields there is an increasing tendency toward destructive exploitation. Some of the temporary exploitation seems necessary; some, however, does not. Oft-times conservation policy can be drastically changed to meet war efforts demand and at the same time actually aid in putting some new or better practice into effect.

In the past, the Ohio Division of Conservation and Natural Resources has raised only one crop of fishes annually in its highly-specialized fish farms. Bass and other game fish have received first consideration, and only secondary consideration has been given such food fishes as the catfishes. Realizing the growing need of fishes as protein food for war needs, the State Conservation Commission recently announced that the fish farms will be used this year to produce two crops instead of one as heretofore. The first crop will be bass and the second food fishes. Instead of using 200 tons of carp to raise four- to eight-inch bass for fall liberation, a much larger number of bass fry will be hatched in the ponds and liberated at three weeks of age. The ponds will be stocked immediately with the adults or fry of food fishes, and these will be fed on middlings and meat scraps, which cannot be used directly for human consumption. In addition to the food fishes produced in the ponds, the 200 tons of carp will be saved for human use, thus adding still more to the nation's food supply.

The plan also keeps the hatcheries phase of fisheries work intact and in readiness for expansion at the end of the war.—M. B. Trautman.

Water Conservation

"There seems to a general idea now that something must be done about water conservation; something more than has ever been done in a state where the land policy has been to drain and develop more fields. There are conservationists who assert that Indiana has got a good start toward producing a dust bowl of its own, and that the water problem is the most serious and most fundamental of all the conservation problems facing the state. It is not merely a question of fish and game; it is becoming a question of alternate flood and drought; a question of good crops or poor; it is a question of food and prosperity." (*Outdoor Indiana*, 9 Feb., 1942: 19.)—F.N.H.

Wildlife Conservation Committee,
Frederick N. Hamerstrom, Jr., Chairman

ORNITHOLOGICAL LITERATURE

AMERICAN BIRD SONGS. Recorded by the Albert R. Brand Bird Song Foundation, Laboratory of Ornithology, Cornell University. Released by Comstock Publishing Co., Cornell Heights, Ithaca, N.Y. 1942. Six standard, ten-inch, double disks in album. $5.00 postpaid.

Here are the bird song recordings that ornithologists have been waiting for. Their appetites whetted by the two earlier (1934, 1936) offerings of bird song recordings by Albert Brand and his associates, bird students will get real satisfaction from this splendid series of six standard double-faced records of the songs and instrumental music of 72 species of North American birds. The species range from common birds of the East to West Coast species like the Wren-tit and California Thrasher and from the drumming of the Ruffed Grouse to the cacophonic chorus of Texas Chachalacas.

There is, naturally, some variation in the perfection of the recording and a few species are somewhat marred by an obtruding background of mechanical sound caused, perhaps, by too great amplification of the original recording. However, other songs, such as the thrushes, orioles, and the Mockingbird, are remarkably perfect. In any case it will repay the bird student to experiment a little with different phonographs and even different needles and adustments of any single machine. Under the best possible conditions of reproduction these records give an astonishingly good rendition of bird song.

The Albert R. Brand Bird Song Foundation has indeed presented us with a remarkable new means of facilitating bird study. No longer need the student spend years, for example, tracing for himself and attempting to remember and compare the songs of the Veery, the Olive-backed, the Hermit, and the Wood Thrush; now he need merely run the Brand record a few times and compare directly these authentically labeled, excellent renditions of all four species.—J. Van Tyne.

WISCONSIN BIRDS. A PRELIMINARY CHECK LIST WITH MIGRATION CHARTS. By N. R. Barger, Elton E. Bussewitz, Earl L. Loyster, Sam Robbins, Walter E. Scott. Wisconsin Society of Ornithology. 1942. 32 pp. $.25 of Earl L. Loyster, Care of Wis. Conservation Dept., State Office Building, Madison, Wis.

This very useful publication provides additional evidence of the great increase in active ornithological work now taking place in Wisconsin. The last complete work on Wisconsin birds appeared in 1909 and the need for a new one is great. The present list will temporarily fill that gap and will stimulate and guide much of the work that is necessary before an adequate new book can be prepared.

The arrangement of this list is rather novel. The greater part consists of a series of tables on the even pages which list the names of the 366 forms recognized as occurring in Wisconsin and gives a very brief summary of their status, followed by a chart showing the seasonal distribution of records. On the opposite page one finds the same species listed and space provided for recording the numbers of each found on 10 field trips. The rigidity of this scheme results in the providing of places for future listing of some extinct or extirpated birds but the amount of space thus wasted is not great. From the introduction we learn that 228 forms have been found breeding in Wisconsin but it is not possible to recognize all of them on the tabular list.

There are some small, obvious slips like the listing of "Turkey Vulture, species undetermined," but these are few.

Except for one footnote, scientific names are not given but the authors state that they have followed the A. O. U. Checklist nomenclature.

A modified Life Zone map of the state appears on the back cover but is not referred to in the text. The paper concludes with a properly conservative hypothetical list of 27 forms and a bibliography of about 70 titles.—J. Van Tyne

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